VDOT Plans Preparation Training

Training Manual

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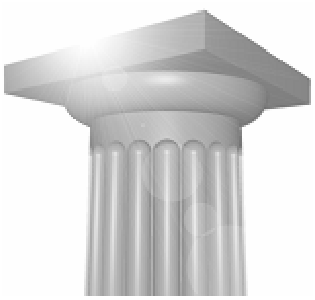

VDOT Plans Preparation Training

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Introduction

GEOPAK is a comprehensive software package that covers every project phase from conceptualization to final quantities and construction stake-out. The software works within the MicroStation graphic environment providing *true interactive design.* For example, a horizontal alignment can be created graphically, it can be calculated with the coordinate geometry component of GEOPAK or some interactive combination of the two. Dynamic on-screen design provides immediate interpretation of plan view geometrics for making design choices through visualization.

Using GEOPAK will help ensure consistency and accuracy of design work and generate a significant time savings in the overall effort of producing construction plans.

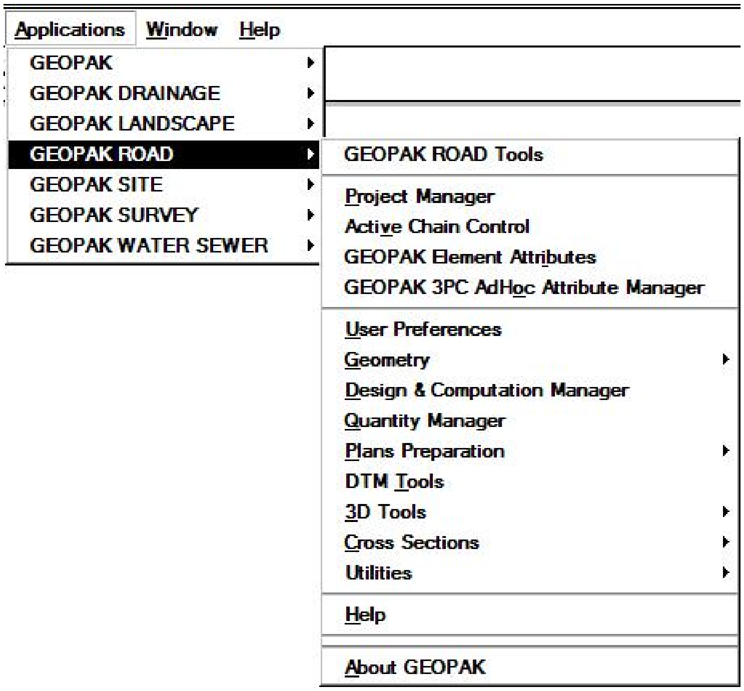
1.1 File Names

GEOPAK uses and/or creates files during the design process. Several of the more common files are detailed in the table below.

job###.gpk	This binary file is created when the user starts a coordinate geometry (COGO) session for the first time or created through Project Manager. The file may be appended to during the design process. All coordinate geometry elements are stored in this file. Multiple users can access this file at the same time, and only one file should be created for each project. The "###" is the only variable in this filename. It represents a **job number** (up to 3 alphanumeric characters) unique to a project and is defined by the user upon creation.
***fname*###.ioc** **Example:** **align999.ijd**	ASCII input file for loading data during a COGO session. "###" represents the job number and "oc" is the operator code (users initials). Filename characters are limited to 5 characters plus the 3 job number character designation as indicated with the example.
***fname*###.ooc** **Example:** **align999.ojd**	ASCII output file created by GEOPAK during a COGO session. Variables are the same as defined above. Filename characters are limited to 5 characters plus the 3 job number character designation as indicated with the example.
***fname*.inp** **Example: desxs.inp**	Any ASCII input file for running GEOPAK processes. Name is user defined with a .INP extension.
***fname*.dat**	A binary file that contains string and point information to be used for digital terrain model construction.
***fname*.tin**	A binary file containing triangular surfaces also known as the digital terrain model (DTM).
***Project-name*.prj**	Binary file resulting from the creation of a new project.

1.2 Accessing GEOPAK

GEOPAK is started upon entering a MicroStation File. To verify that GEOPAK is active, scan the MicroStation menu bar where the **Applications** menu appears. Simply select **Applications > GEOPAK Road**. When each GEOPAK tool is selected, the corresponding dialog box(es) will appear.


Applications
Window
Help
GEOPAK
GEOPAK DRAINAGE
GEOPAK LANDSCAPE
GEOPAK ROAD
GEOPAK SITE
GEOPAK SURVEY
GEOPAK WATER SEWER
GEOPAK ROAD Tools
Project Manager
Active Chain Control
GEOPAK Element Attributes
GEOPAK 3PC AdHoc Attribute Manager
User Preferences
Geometry
Design & Computation Manager
Quantity Manager
Plans Preparation
DTM Tools
3D Tools
Cross Sections
Utilities
Help
About GEOPAK

To close a dialog box, the following options are available:

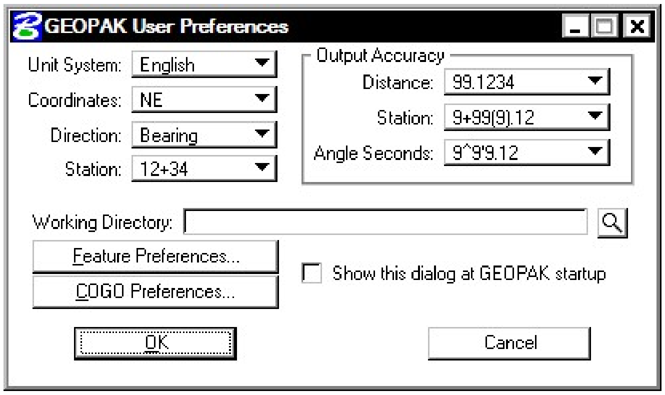
- Click the **X** in the upper right corner of the dialog box
- Select the **File > Exit** option
- Or click **Cancel** on the dialog box

Use one of the above options that appear in the dialog box.

Exiting the MicroStation file automatically closes all GEOPAK dialog boxes.

1.3 User Preferences

When a user begins Geopak for the first time or after Geopak has been reloaded, there are certain **User Preferences** the user needs to set. The **User Preferences** dialog box can be accessed from **Applications > Geopak Road > User Preferences**. The following dialog box appears.

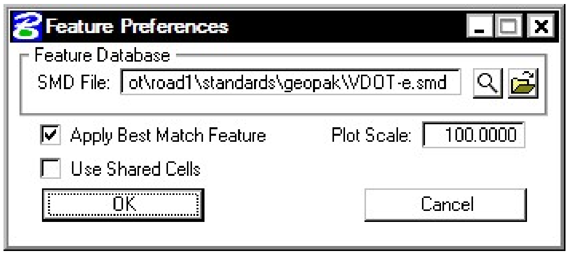


Unit System: English
Coordinates: NE
Direction: Bearing
Station: 12+34
Distance: 99.1234
Station: 9+99(9).12
Angle Seconds: 9^9'9.12
Working Directory:
☐ Show this dialog at GEOPAK startup

Most of the settings in this dialog box can be defined when a project is created within Project Manager (See Chapter 2).

The **Working Directory** identifies where the data files for a particular project can be found. If a user does not want to work within a specific project, the field may be left blank, and Geopak uses the directory wherein the open MicroStation file is located.

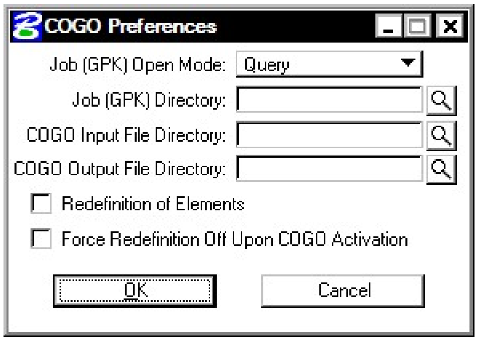
By clicking the **Feature Preferences** button, the following dialog box is invoked.



SMD File: ot\road1\standards\geopak\VDOT-e.smd
☑ Apply Best Match Feature
Plot Scale: 100.0000
☐ Use Shared Cells

This defines the default file utilized for representation of coordinate geometry and survey elements when visualization is utilized during an active coordinate geometry session as well as the scale in which these elements will be displayed.

By pressing the **COGO Preferences** button, the following dialog box is invoked.



Job (GPK) Open Mode: Query
Job (GPK) Directory:
COGO Input File Directory:
COGO Output File Directory:
☐ Redefinition of Elements
☐ Force Redefinition Off Upon COGO Activation

The **Job (GPK) Directory** field specifies the location of the GPK file. Since multiple people can read and write the GPK file simultaneously, it is possible to have this file on a server or in a shared folder. If any of the above directory fields are blank, they will default to the **Working Directory** set in the GEOPAK User preferences dialog box.

LAB 1: User Preferences

Define Design Preferences

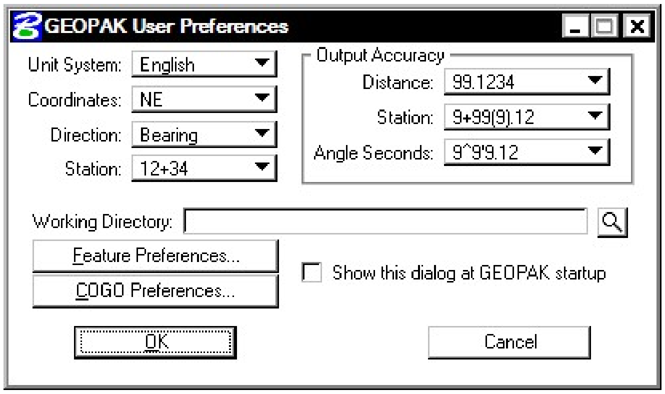
Step 1. Execute **C:\data\geo\vdot\PlansPrep\LAB1.EXE**.

Note: Make sure you accept the path and unzip the files to C:\.

Step 2. Open the MicroStation file **C:\data\geo\vdot\PlansPrep\d17682des.dgn**

Step 3. Access the GEOPAK User Preferences dialog box from the Applications pulldown. **Applications > GEOPAK Road > User Preferences.**

The **User Preferences** dialog box appears as shown.



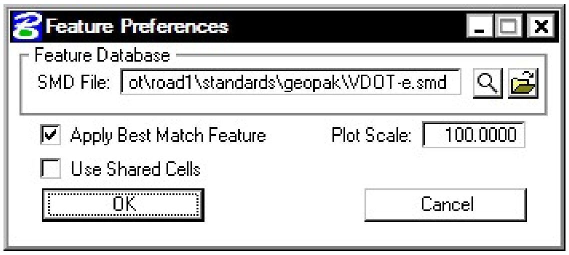
Unit System: English
Coordinates: NE
Direction: Bearing
Station: 12+34

Output Accuracy
Distance: 99.1234
Station: 9+99(9).12
Angle Seconds: 9^9'9.12

Working Directory:

☐ Show this dialog at GEOPAK startup

Step 4. Click the **Feature Preferences** button and set the Plot Scale to **100** as shown and toggle on **Apply Best Match Feature**.



Feature Database
SMD File: ot\road1\standards\geopak\VDOT-e.smd

☑ Apply Best Match Feature
Plot Scale: 100.0000
☐ Use Shared Cells

Step 5. Click **OK**.

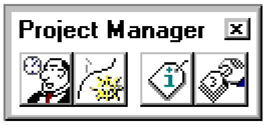
Step 6. On the GEOPAK User Preferences dialog box, click **OK**.

Step 7. **Exit** MicroStation.

CHAPTER 2

Project Manager

2.1 Introduction

Objectives	Learn how to set up a project using **Project Manager**. Learn how to utilize **Project Manager** as a workflow guide. Learn how to access GEOPAK dialog boxes from the **Project Manager**.
Menu Bar Application	**Applications > GEOPAK Road > Project Manager**
Road Tool Frame	

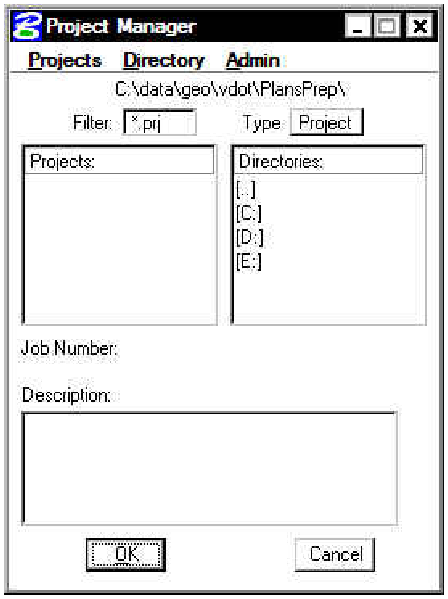
Project Manager is a GEOPAK tool that associates a project with its respective coordinate geometry job number, users, working directories and project files. Project Manager provides the user with an easy workflow system that keeps records of processes run throughout the design of a project.

2.2 Accessing Project Manager

To access Project Manager, select **Applications > GEOPAK Road > Project Manager** or click the Project Manager icon. The adjacent dialog box appears.

The current directory is displayed at the top of the dialog box. This may be modified by traversing to a different directory in the **Directories** list box. Project files (.prj) are displayed in the projects list box.

The remainder of the Project Manager dialog box displays information after a project has been selected from the **Projects** list box. At the bottom of the dialog box are the **OK** and **Cancel** buttons. To exit Project Manager, click the **Cancel** button. To continue in the Project Manager process, click the **OK** button.



C:\data\geo\vdot\PlansPrep\

Filter: *.prj

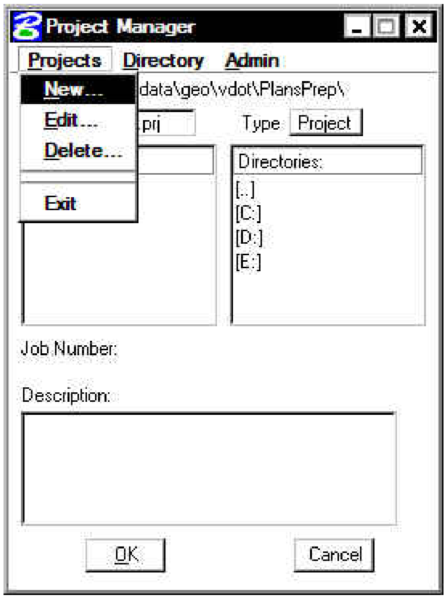
Type: Project

2.3 Project Manager Menu Bar

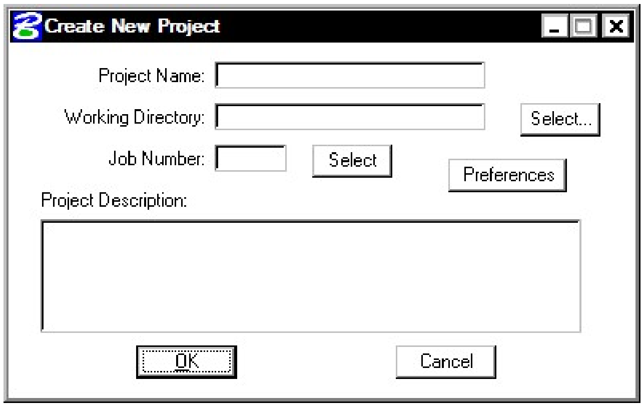
There are three options on the Menu Bar: **Projects, Directory** and **Admin.** Each of these choices has tools contained in the pull down.

2.3.1 Project Tools

There are four options under the Projects pull down, **New, Edit, Delete** and **Exit** as shown below.


Project Manager
Projects
Directory
Admin
New...
Edit...
Delete...
Exit
data\geo\vdot\PlansPrep\
.prj
Type
Project
Directories:
[..]
[C:]
[D:]
[E:]
Job Number:
Description:
OK
Cancel

The **New** menu option is used to create a new project. The .prj file is stored in the directory shown in the Directory path at the top of the Project Manager dialog box. When the **New** menu option is selected, the following Create New Project dialog box appears.

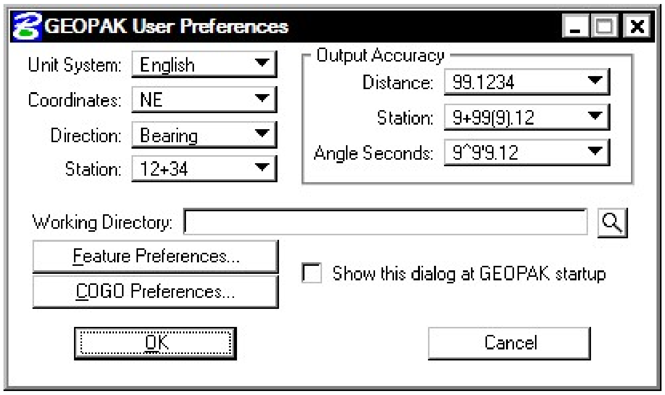

Create New Project
Project Name:
Working Directory:
Select...
Job Number:
Select
Preferences
Project Description:
OK
Cancel

The **Project Name** can be any number of alphanumeric characters. The **Working Directory** specifies the location of the project data files and may be manually entered. In lieu of typing, the **Select** button may be clicked and the appropriate directory selected.

The **Working Directory** can be left blank if it is desired to have all of the MicroStation and GEOPAK files in a single directory.

The next field is for keying in the COGO **Job Number** or the **Select** button may be clicked and the appropriate COGO job number selected.

Next, the **Preferences** button should be clicked, invoking the Project Preferences dialog box.

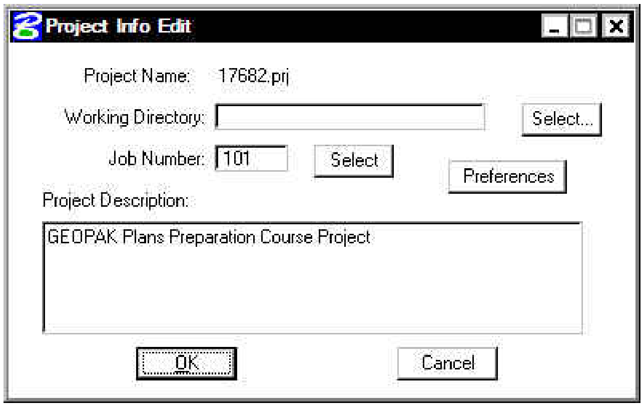


Unit System: English
Coordinates: NE
Direction: Bearing
Station: 12+34
Distance: 99.1234
Station: 9+99(9).12
Angle Seconds: 9^9'9.12
Working Directory:
☐ Show this dialog at GEOPAK startup

The user may click on COGO Preferences, then set the particular parameters for each project as well as the directories for the COGO job number, COGO input files and COGO output files. By setting these parameters for each project, the user can open a design file in one directory and then open another design file in a different directory and still access the correct .gpk file and also save Cogo input and output files to the proper directory. The user simply chooses the project and all parameters are automatically set. After all the information is entered, the **OK** button is clicked or if the user wishes to abort, the **Cancel** button may be clicked.

NOTE**:** If these fields are left blank, the project working directory is used.

Shown below is a sample project that includes a project description, which may be keyed in at the bottom of the Create New Project dialog box or added later by accessing it from the Edit menu.



Project Name: 17682.prj
Working Directory:
Job Number: 101
Project Description:
GEOPAK Plans Preparation Course Project

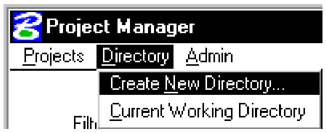
The **Edit** option on the pull down menu is used to change any settings associated with the currently selected project.

The **Delete** option on the pull down menu is used to delete any project that has been stored. The user highlights the project in the Projects list box and selects **Delete.**

The **Exit** option on the pull down menu closes the Project Manager and writes the settings to a resource file.

2.3.2 Directory Tools

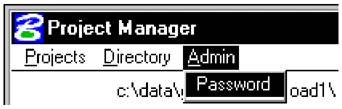
There are two options under the **Directory** pull down, **Create New Directory** and **Current Working Directory** as shown.


Project Manager
Projects
Directory
Admin
Create New Directory...
Current Working Directory
Filt

The **Create New Directory** option creates a new directory on your computer within the current directory. If the **Current Working Directory** option is chosen, the directory path in Project Manager is changed to that directory.

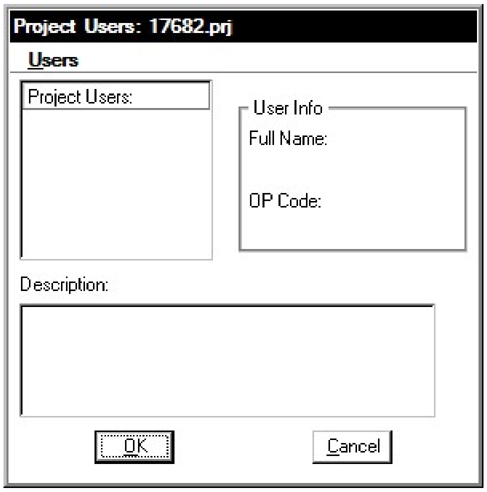
2.3.3 Administration Tools

The Administration menu option is used to set a password on a project, if desired.


Project Manager
Projects
Directory
Admin
c:\data\
Password
oad1\

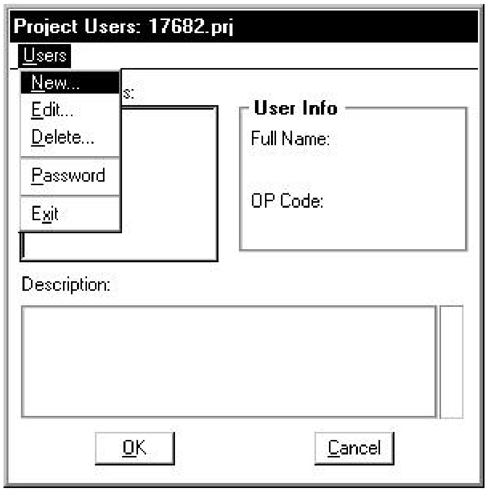
2.4 Project Users Dialog Box

Once a project is highlighted and **OK** is selected, the Project Users dialog box appears.


Project Users: 17682.prj
Users
Project Users:
User Info
Full Name:
OP Code:
Description:
OK
Cancel

This dialog box has three sections: **Project Users, User Info** and **Description**. The **Project Users** list displays a list of users that have been created to work with any project that resides in the current projects home directory. The names shown in **Project Users** will be the user id's of the people working on that project as specified in the **Start Job** dialog box. Within the **User Info** group box, the **Full Name** field further identifies the user, and displays the full name of the user that is currently selected. The **OP Code** field displays the Geopak Operator Code of the currently selected user. The Geopak Operator Code is used for all coordinate geometry operations during this session. The Operator Code, along with the Job Number will be utilized whenever a COGO input or output file is created by the software. The Operator Code is typically the user's initials. The **Description** field displays the description of the currently selected user.

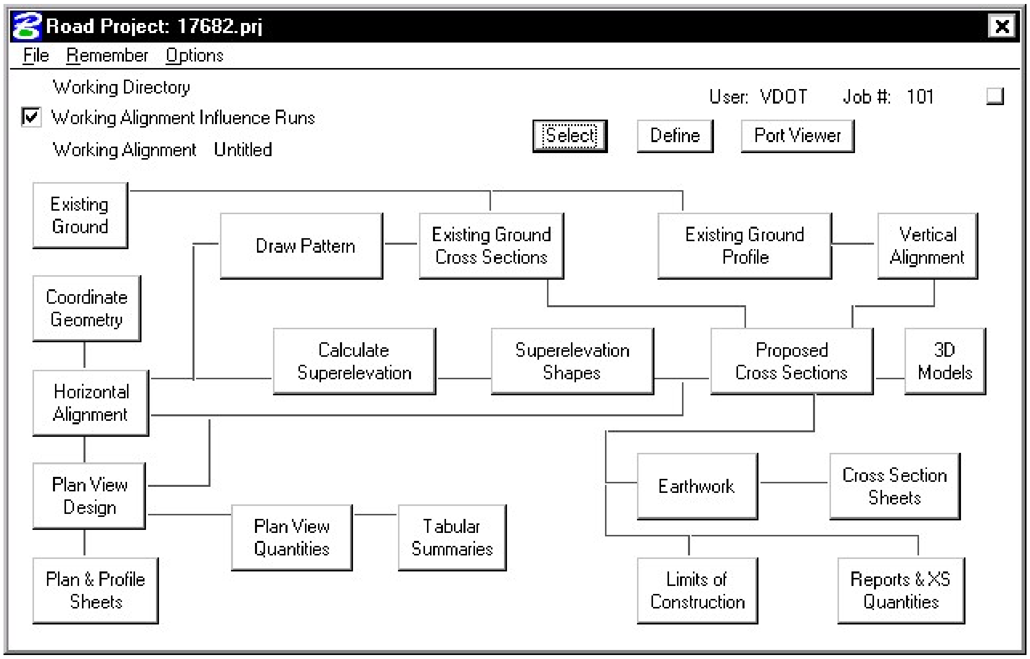
Four tools are supported on the Project Users pulldown as depicted in the exploded view below.


Project Users: 17682.prj
Users
New...
Edit...
Delete...
Password
Exit
s:
User Info
Full Name:
OP Code:
Description:
OK
Cancel

New	The New pull down menu option creates new users. This option will create users only for the selected project.
Edit	Enables the user to change any of the parameters of the currently selected user. **(Note: The User cannot be changed.)** This changes the user information for the current project only.
Delete	Deletes the highlighted user.
Password	Creates or modifies a password for the selected user. If the selected user already has a password, the user will be prompted to enter the current password before continuing.
Exit	Closes the User Dialog box and returns back to the Project Manager dialog box.

2.5 Road Project Dialog Box

After a minimum of one user has been defined, click the **OK** button in the lower left corner of the Project Users dialog box or double click on a Project User, which opens the **Project Manager** dialog box.



Road Project: 17682.prj

Working Directory

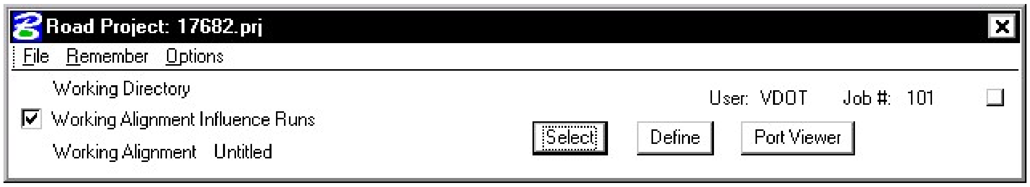
☑ Working Alignment Influence Runs

Working Alignment Untitled

User: VDOT Job #: 101

File
Remember
Options
☐
Select
Define
Port Viewer
Existing Ground
Coordinate Geometry
Horizontal Alignment
Plan View Design
Plan & Profile Sheets
Draw Pattern
Existing Ground Cross Sections
Existing Ground Profile
Vertical Alignment
Calculate Superelevation
Superelevation Shapes
Proposed Cross Sections
3D Models
Plan View Quantities
Tabular Summaries
Earthwork
Cross Section Sheets
Limits of Construction
Reports & XS Quantities

The top of the dialog box displays the **Working Directory, Working Alignment** (if defined), **User** and **GEOPAK Job Number.** In addition, a toggle for **Working Alignment Influence Runs** is also supported. The bottom portion of the dialog box displays the various processes supported during the design process. The small square in the upper right corner will condense the dialog box as depicted in the graphic below.



Road Project: 17682.prj

Working Directory

☑ Working Alignment Influence Runs

Working Alignment Untitled

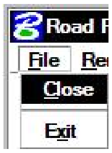
User: VDOT Job #: 101

File
Remember
Options
☐
Select
Define
Port Viewer

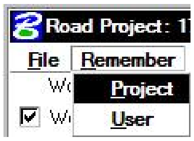
2.5.1 Road Project Dialog Menu Bar

There are two pull down menu bar options: **File** and **Remember**. When the **File** option is selected, **Close** and **Exit** are supported.

If the **Close** option is selected, the user is returned to the Applications dialog box. If **Exit** is selected the user is exited from the Project Manager.

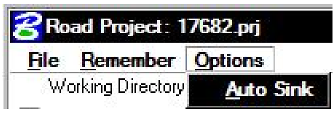


When the **Remember** option is selected, the user can instruct the software to remember the Project, or User in subsequent sessions. For example, if both toggles are activated, and the Project Manager is completely closed (all dialog boxes), the invocation of the Project Manager immediately invokes the Road Project dialog box (flow chart) and utilizes the project name and user name, which were active when the **Remember** toggles were selected.



If only the **Project** toggle is activated, the user is returned to the Project Users dialog box in subsequent sessions. This option is particularly useful when numerous users are working on one project.

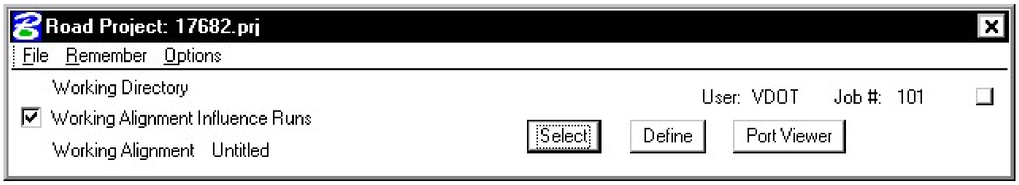
When the **Auto Sink** option is enabled, the Road Project flow chart sinks behind all open views when any tool is selected from the flow chart. Once the tool is closed, the Road Project flow chart will be brought to the top of the view window.



2.5.2 Working Alignment

The concept of a working alignment enables the designer to organize a project and to access project information without continually typing the required information. On a simple project, only one working alignment may be needed. However, on a more complicated project, an unlimited number of working alignments may be defined. With each working alignment, the designer can define associated data, i.e., name of cross section and plan view files, element symbology, etc. The designer can easily change from one working alignment to another by highlighting the desired alignment listed in the **Select** dialog box. Once the working alignment is selected, all previously stored data is utilized in subsequent processing. Three tools relating to working alignments are located at the top of the Road Project dialog box:

- **Select** Button
- **Define** button
- **Working Alignment Influence Runs** (toggle on left side of dialog box)



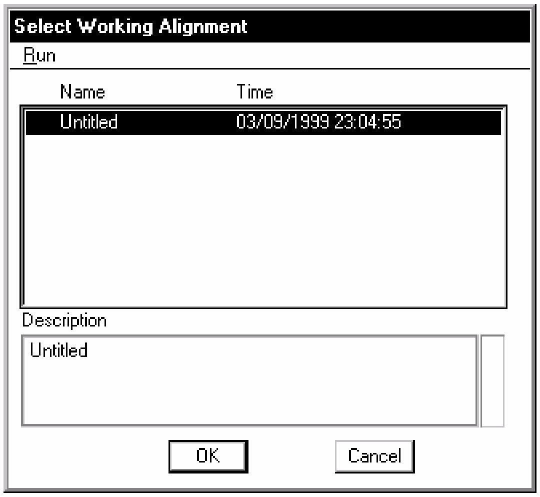
☑ Working Alignment Influence Runs

Working Alignment Untitled

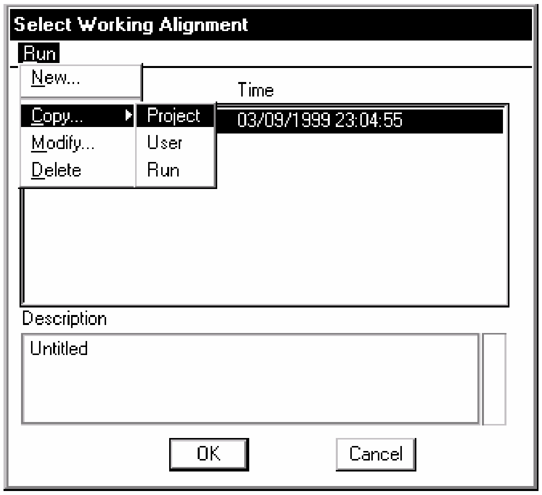
User: VDOT Job #: 101 ☐

The **Port Viewer** (covered in detail in Chapter 13 of the Road 1 Manual) is a tool that enables the user to view and manipulate all three major aspects of a road design simultaneously, even though they are located in different files. The Port Viewer tool is only available while working within the Project Manager application.

2.5.2.1 Select Option


Select Working Alignment
Run
Name
Time
Untitled
03/09/1999 23:04:55
Description
Untitled
OK
Cancel

When the **Select** button is clicked, the Select Working Alignment dialog box appears as depicted to the right. If no working alignments have been defined, UNTITLED appears in the Run List box. If working alignments have been defined, they are listed with the last run time. The description of the working alignment can be seen in the bottom of the dialog box when each Name is highlighted. To select a previously defined working alignment, highlight the run from the list, then click the **OK** button at the bottom of the dialog box. Double clicking on the Name also selects a previous working alignment for subsequent processing. Clicking the **Cancel** button will close the Select Run dialog box without any File selection. Several Run options are supported as depicted in the exploded view below.

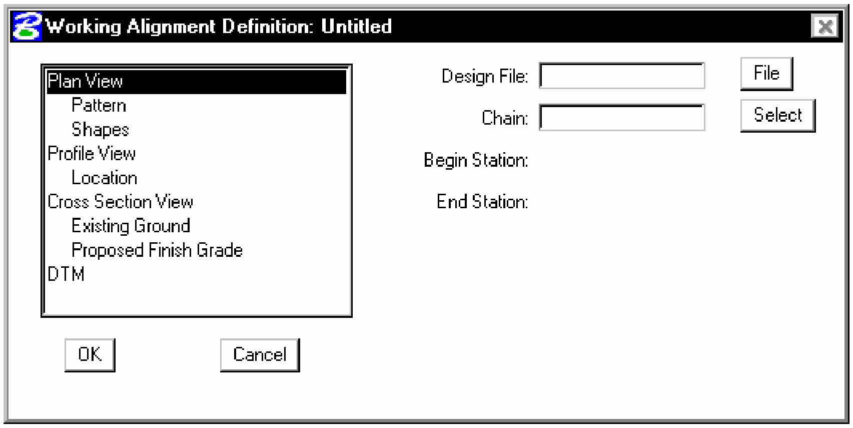

Select Working Alignment
Run
New...
Copy...
Modify...
Delete
Project
User
Run
Time
03/09/1999 23:04:55
Description
Untitled
OK
Cancel

These are detailed in the table below.

New	Create a new working alignment
Copy	Copy a run from an existing Project, a User in the same project or Run created by the current user.
Modify	Change the name of the existing working alignment.
Delete	Delete an existing working alignment.

2.5.2.2 Define Option

Once a Run has been selected, clicking the **Define** button invokes the dialog box depicted below.

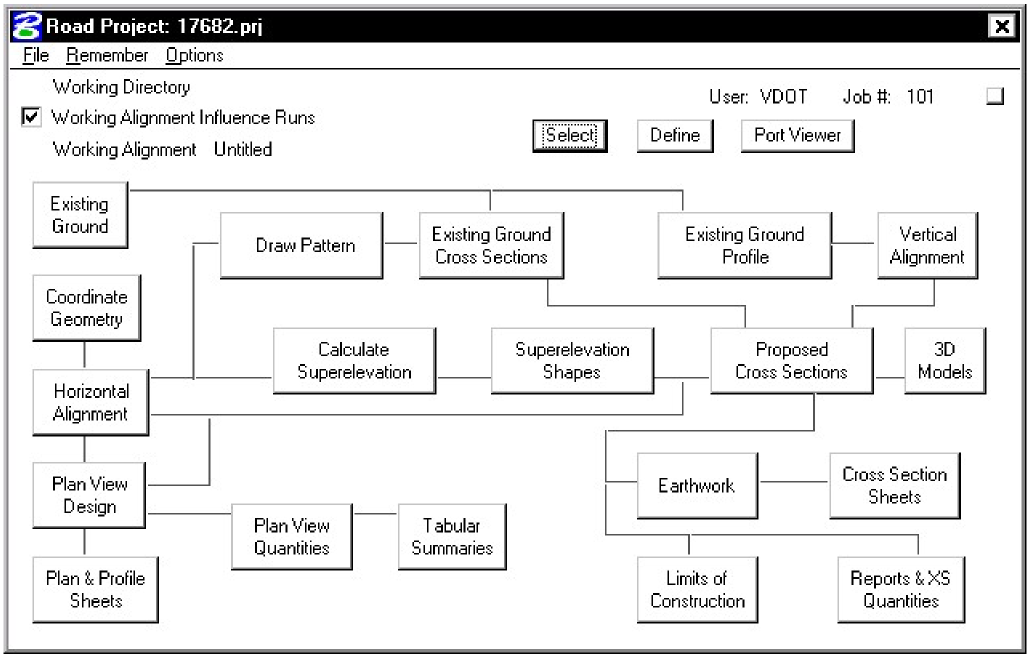

Working Alignment Definition: Untitled
Plan View
Pattern
Shapes
Profile View
Location
Cross Section View
Existing Ground
Proposed Finish Grade
DTM
Design File:
Chain:
Begin Station:
End Station:
File
Select
OK
Cancel

The information that can be associated with a working alignment is listed in the left portion of the dialog box. As each option is chosen, the right side of the dialog box will change to reflect the information needed as can be seen in the dialog box to the right after Profile View was selected.

All information entered in these fields can be used in subsequent processes run from Project Manager. In the beginning of a project, much of this information will not be known, but as the user goes through the design process, it can be added to the working alignment definitions.

For example, as soon as a chain has been stored in COGO, the user can enter that information in the Plan View fields on the right side of the dialog box. For a more complete explanation of each option shown, please see the GEOPAK Manual or On-Line Help.

2.6 Project Manager Process


Road Project: 17682.prj

User: VDOT Job #: 101

☑ Working Alignment Influence Runs

Working Alignment Untitled
File
Remember
Options
Working Directory
Select
Define
Port Viewer
Existing Ground
Coordinate Geometry
Horizontal Alignment
Plan View Design
Plan & Profile Sheets
Draw Pattern
Existing Ground Cross Sections
Existing Ground Profile
Vertical Alignment
Calculate Superelevation
Superelevation Shapes
Proposed Cross Sections
3D Models
Earthwork
Cross Section Sheets
Plan View Quantities
Tabular Summaries
Limits of Construction
Reports & XS Quantities

The primary Project Manager dialog box is depicted above. The advantage of utilizing the Project Manager rather than selecting functions directly from the Road menu is that pertinent information stored within the Project Manager is automatically displayed within the invoked dialog box. Therefore, job numbers, chain names, stationing, file names and data associated with the project do not have to be typed in each time a dialog box is utilized. However, if the user chooses to change the fields, they have that option.

Many of the Project Manager processes function identically to their corresponding dialog boxes invocation from the Road menu. However, some of the procedures invoke the Select Run dialog box prior to invoking the actual dialog box. The Select Run dialog box enables the user to set up different options to use in alternative design choices or different typicals.

2.7 Online Help

More information can be found under **Applications > GEOPAK Road > Help > Command Reference > Project Manager**.

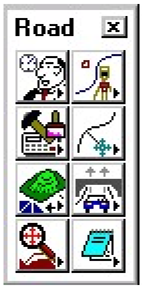
LAB 2: Project Manager

Introduction

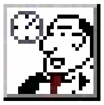
Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB2.EXE**.

Step 2. Open the MicroStation file **C:\data\geo\VDOT\PlansPrep\d17682dtm.dgn**

Step 3. Invoke the Road Tools tool frame from the MicroStation menu bar by selecting **Applications > GEOPAK Road > GEOPAK Road Tools.**



Step 4. Access Project Manager using the Project Manager icon from the Road Tools tool frame.



Step 5. From the right side of the Project Manager dialog box, in the Directories list box, ensure that the project directory is set to:

C:\data\geo\VDOT\PlansPrep\

You can navigate quickly to your current working directory by using the pulldown Directory > Current Working Directory.

Select the **Projects > New** pulldown and create a new project as defined in the table below:

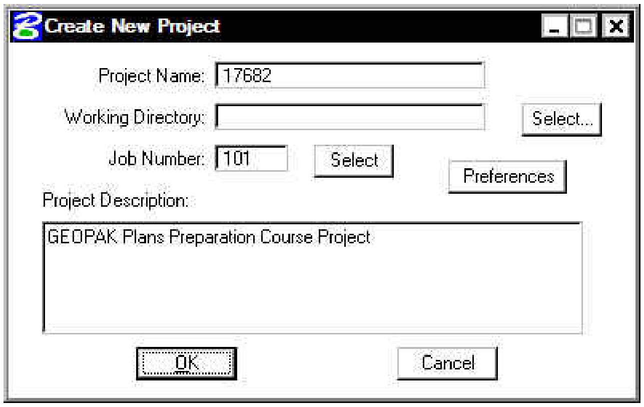
Project name: 17682

Working Directory:

Job Number: 101

Project Description: GEOPAK Plans Preparation Course Project

After filling out the dialog box as shown below, click **Preferences**.


Create New Project
Select...
Select
Preferences
OK
Cancel

Project Name: 17682

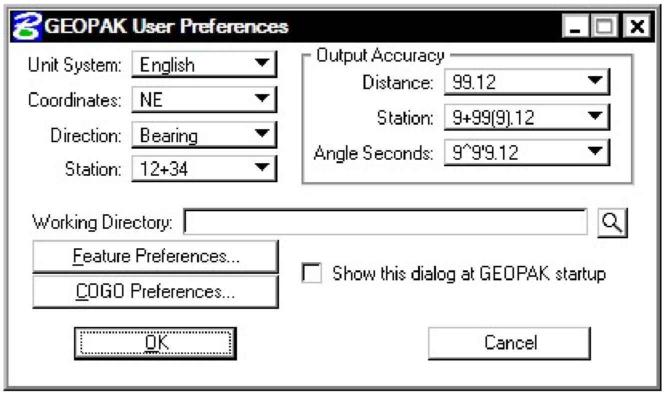
Working Directory:

Job Number: 101

Project Description:

GEOPAK Plans Preparation Course Project

Step 6. Set the project preferences as shown in the dialog box below. Click **OK** when complete.


GEOPAK User Preferences
Feature Preferences...
COGO Preferences...
OK
Cancel

Unit System: English

Coordinates: NE

Direction: Bearing

Station: 12+34

Output Accuracy

Distance: 99.12

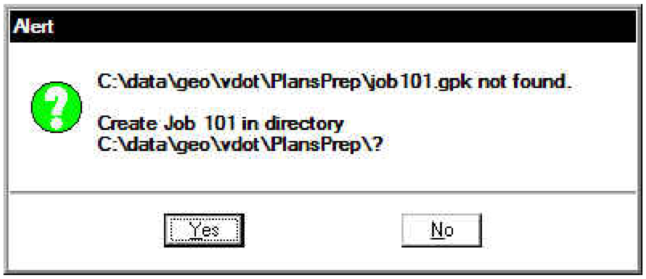
Station: 9+99(9).12

Angle Seconds: 9^9'9.12

Working Directory:

☐ Show this dialog at GEOPAK startup

Step 7. After exiting the Preferences dialog box, you will return to the Create New Project dialog box. If everything here is satisfactory, click the **OK** button. An **Alert** message is displayed stating that Job 101 was not found in the Working Directory in which you defined.

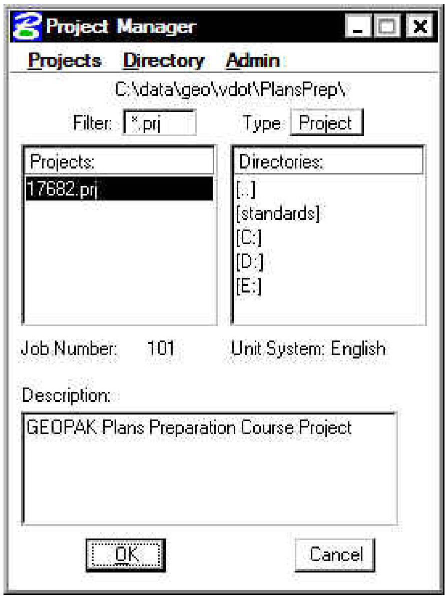

Alert
Yes
No

C:\data\geo\vdot\PlansPrep\job101.gpk not found.

Create Job 101 in directory
C:\data\geo\vdot\PlansPrep\?

Click **Yes** to automatically create this job file.

Step 8. The main Project Manager dialog box is now displayed and the project has been created and ready to be accessed. To access the project, select the project by single clicking on name of the project in the dialog box. The project is highlighted as shown in the dialog box with all pertinent information displayed.


Project Manager
Projects
Directory
Admin
OK
Cancel

C:\data\geo\vdot\PlansPrep\

Filter: *.prj

Type: Project

Projects:
17682.prj

Directories:
[..]
[standards]
[C:]
[D:]
[E:]

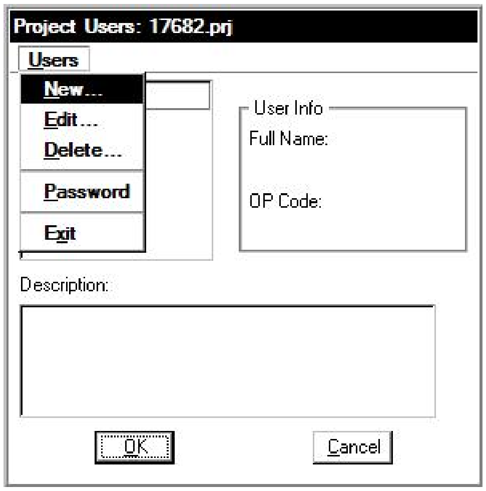
Job Number: 101

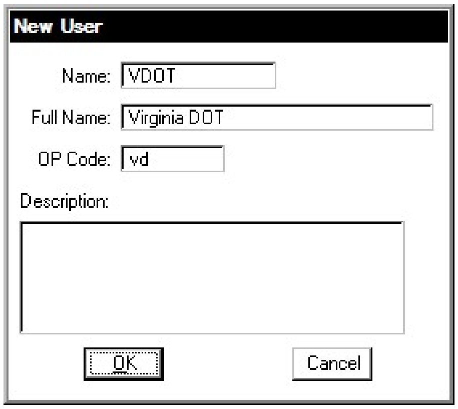
Unit System: English

Description: GEOPAK Plans Preparation Course Project

Click **OK** to invoke the Project Users dialog box as shown in Step 9.

Step 9. Create a new user by selecting **Users > New** from the Project User pull down menu bar. Complete the New User dialog box with the name and operator code as shown.


Project Users: 17682.prj
Users
New...
Edit...
Delete...
Password
Exit
User Info
Full Name:
OP Code:
Description:
OK
Cancel

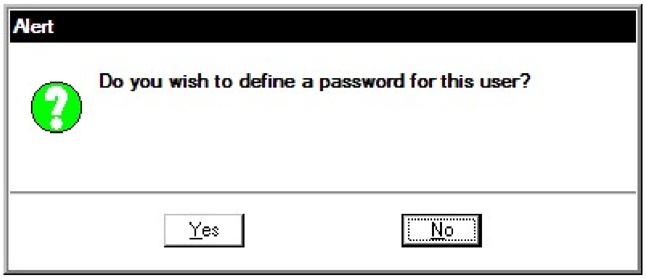

New User
Description:
OK
Cancel

Name: VDOT

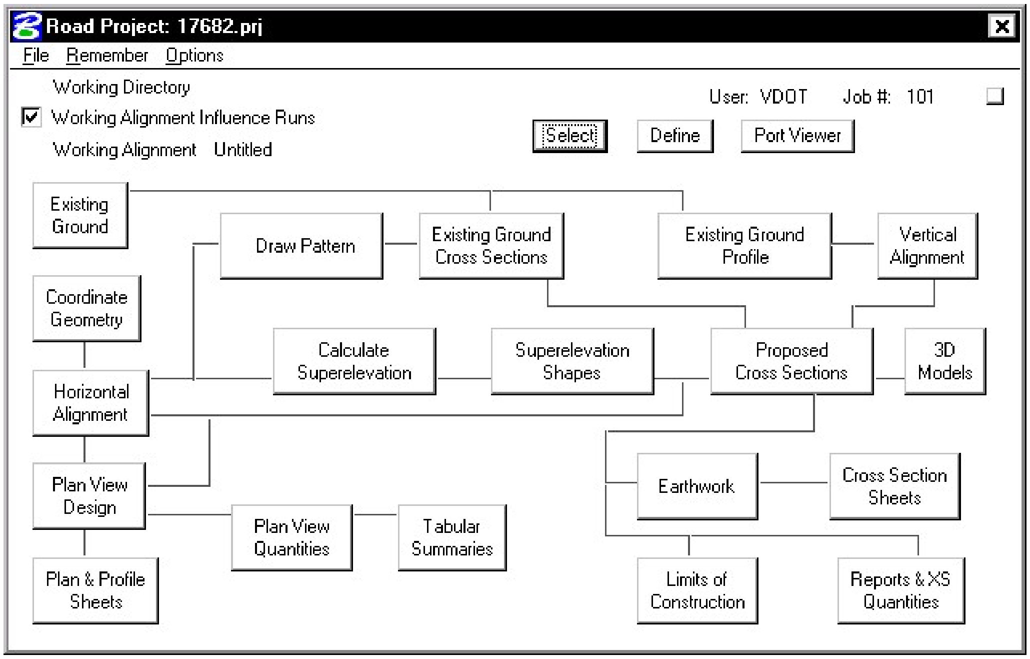
Full Name: Virginia DOT

OP Code: vd

Step 10. After populating the dialog box click **OK**. When prompted to define a password for this user, click **No**.


Alert
Do you wish to define a password for this user?
Yes
No

Step 11. At this point double click the user and you will now see the main Workflow dialog box.


Road Project: 17682.prj
File
Remember
Options
Working Directory
☑ Working Alignment Influence Runs
Working Alignment Untitled
User: VDOT
Job #: 101
Select
Define
Port Viewer
Existing Ground
Draw Pattern
Existing Ground Cross Sections
Existing Ground Profile
Vertical Alignment
Coordinate Geometry
Calculate Superelevation
Superelevation Shapes
Proposed Cross Sections
3D Models
Horizontal Alignment
Plan View Design
Earthwork
Cross Section Sheets
Plan View Quantities
Tabular Summaries
Plan & Profile Sheets
Limits of Construction
Reports & XS Quantities

Step 12. Lastly, use the **Remember** option to have Project Manager remember our Project and User. Enable the **Autosink** option.

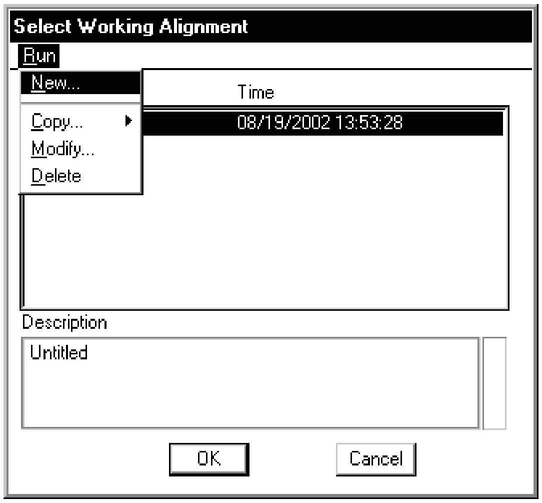
! To create a project, contact the **AES Help Desk**.

2.2 Working Alignment

Before leaving this exercise, let's go ahead and begin to set the stage for further design via the Project Manager by defining the **Working Alignment**. You will usually create a **Working Alignment** for each alignment on your project, but because of time constraints we'll only do it for alignment MAINLINE on our sample project.

To do this, we'll need to use the **Select** and **Define** buttons on the Project Manager Workflow dialog box. The Project Manager workflow dialog box should still be active (we 'sank' it earlier in the lab). Access the dialog box by selecting **Window > Road Project: 17682.prj** from the MicroStation menu bar.

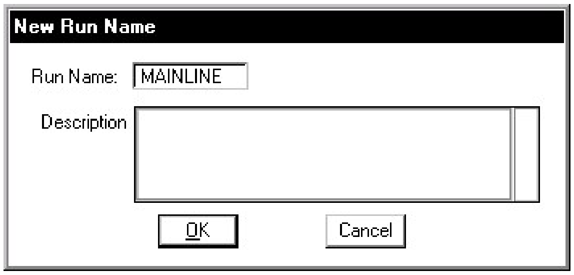
Step 1. Click the **Select** button to create a new Working Alignment. The Working Alignment is the active chain that we are designing for.



08/19/2002 13:53:28

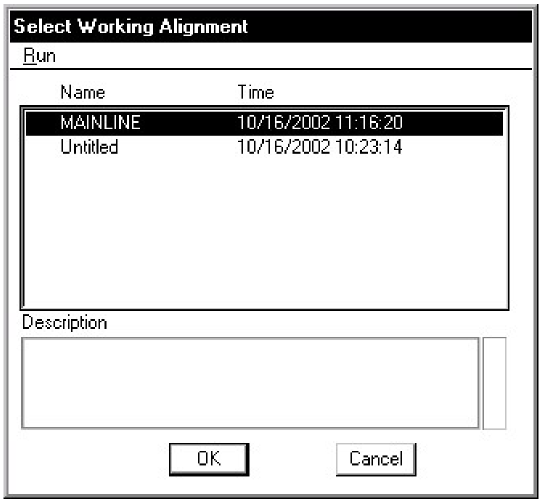
Description: Untitled

Step 2. Create a new Working Alignment called **MAINLINE** as shown below and click **OK**.



Run Name: MAINLINE

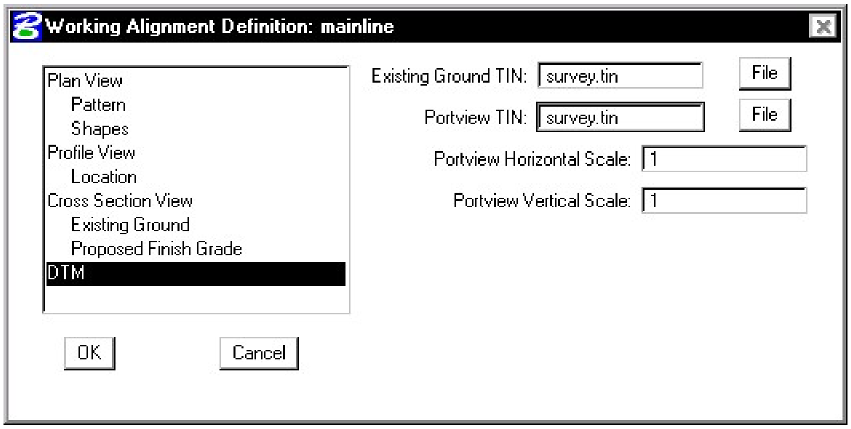
Step 3. After creating the run, select the run by highlighting it in the dialog box and clicking **OK**.


Select Working Alignment
Run
Name
Time
Description
OK
Cancel

Name	Time
MAINLINE	10/16/2002 11:16:20
Untitled	10/16/2002 10:23:14

Step 4. You will now return to the main Workflow dialog box. Click the **Define** button to access the Working Alignment Definition dialog box.

Step 5. Select the DTM item in the list box and complete the DTM definitions as shown below:


Working Alignment Definition: mainline
Plan View
Pattern
Shapes
Profile View
Location
Cross Section View
Existing Ground
Proposed Finish Grade
DTM
File
File
OK
Cancel

Existing Ground TIN: survey.tin

Portview TIN: survey.tin

Portview Horizontal Scale: 1

Portview Vertical Scale: 1

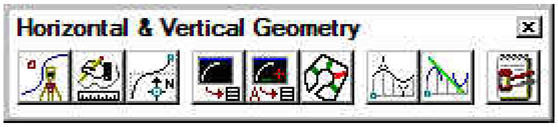
Step 6. Click **OK** to exit the Working Alignment Definition dialog box.

Step 7. **Exit** MicroStation.

CHAPTER 3

Coordinate Geometry

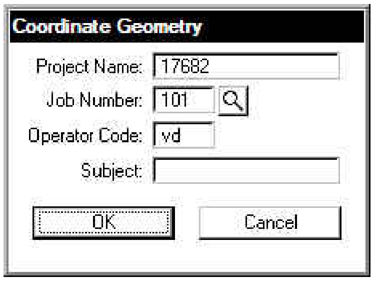
3.1 Introduction

Objectives	Learn to set up and access the coordinate geometry database file. Become proficient in using GEOPAK Coordinate Geometry.
Project Manager	Coordinate Geometry
Tool	
Menu Bar Application	GEOPAK Road > Geometry > Coordinate Geometry

The Coordinate Geometry database file (*.GPK file) is comprised of stored geometric elements such as points, lines, curves, spirals, chains, parcels and profiles. When COGO calculations are completed, the results are stored in the binary database file, which is then utilized throughout the design process with many other applications.

3.2 Accessing COGO

When Coordinate Geometry is started, the Start-Up Dialog box appears.



Coordinate Geometry

Project Name: 17682

Job Number: 101

Operator Code: vd

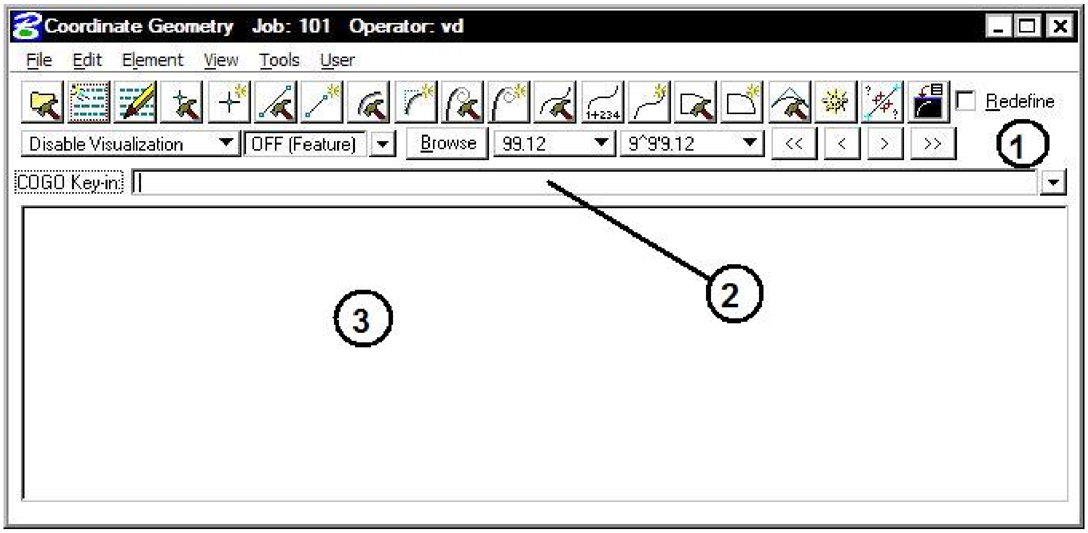
Subject:

The fields in the Start-Up dialog box are detailed below.

Project Name	Name displayed on reports. This is an optional entry, with a maximum of 60 alphanumeric characters. If Project Manager is active, this field is populated automatically.
Job Number	Identifies coordinate geometry database file and is a required field. The job number is a maximum of three alphanumeric characters. If Project Manager is active, this field populated automatically. This field is required.
Operator Code	Unique 2-character code which enables multiple users access to database file. The user's initials are suggested. Note this field is not required for single user access, but highly recommended. If Project Manager is active, this field is populated automatically.
Subject	Description of coordinate geometry work (could relate to the project) with a maximum of 48 alphanumeric characters. This field is optional.

After the dialog box is populated, and the **OK** button is clicked, the main coordinate geometry dialog box is invoked.

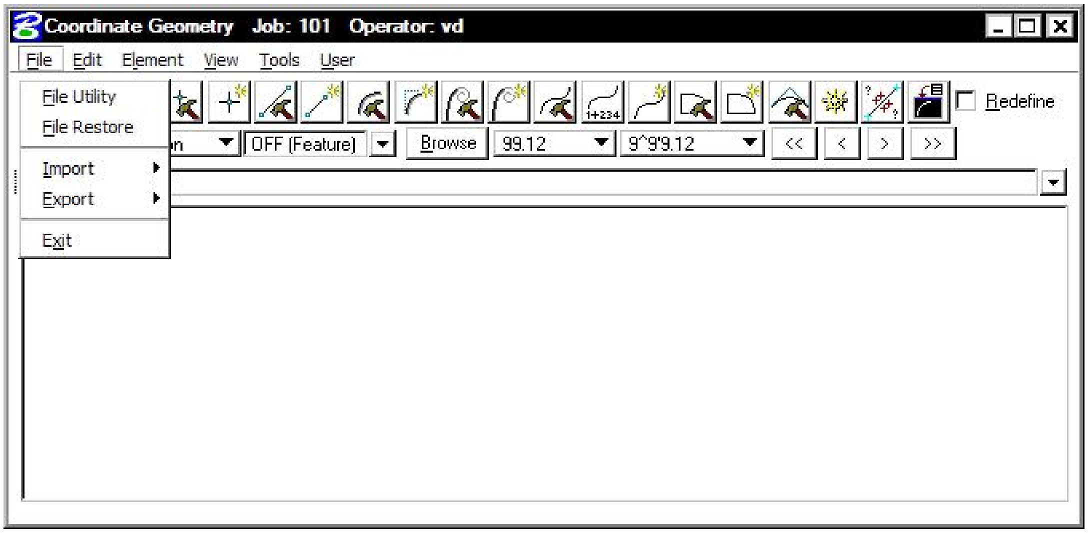
3.3 Coordinate Geometry


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
☐ Redefine
Disable Visualization
OFF (Feature)
Browse
99.12
9^9'9.12
<<
<
>
>>
COGO Key-in:
1
2
3

The coordinate geometry dialog box is made up of three separate display areas:

- **Tool Bar** (**1**) consisting of drop down options and icons. The display of specific icons is customizable.
- **COGO Key-in** (**2**) this field enables manual entry of COGO commands. The drop down button allows for a history of commands to be reviewed.
- **Output Display Window** (**3**) shows the results generated by the commands.

3.3.1 File Commands

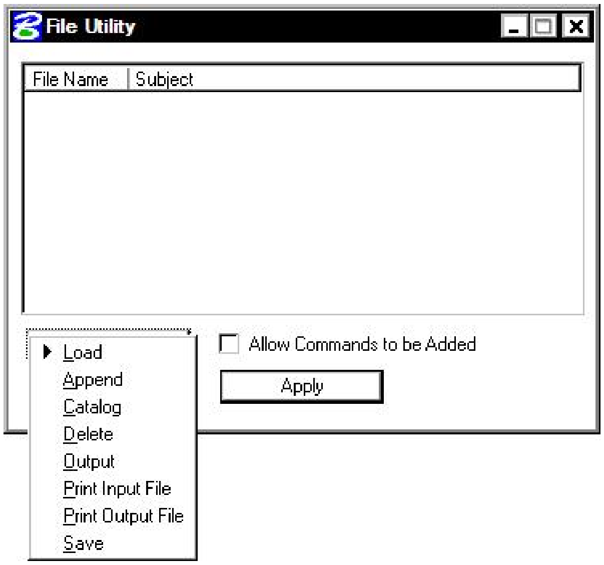

Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
File Utility
File Restore
Import
Export
Exit
OFF (Feature)
Browse
99.12
9^9'9.12
<<
<
>
>>
☐ Redefine

The File commands (as displayed in the exploded view above) are detailed in the table below.

File Utility	This option opens another dialog box that contains a group of file utilities that will be explained later
File Restore	Loads an ASCII file of GEOPAK commands into the display window. Note no processing occurs. The file must be named **j101ovd.inp**, where **101** is the current job number and **vd** is the operator code.
Import	Imports horizontal and vertical alignments and points from RDS and SDMS format into the GEOPAK .gpk file.
Export	Exports GEOPAK points, chains and profiles into formats for use in various data collectors.
Exit	Closes the COGO dialog box and ends the coordinate geometry session. A prompt to save the session appears. **Yes** saves the audit trail, **No** exits without saving, **Cancel** returns to the COGO session. Whether you pick **Yes** or **No** everything you did is still saved in the **.gpk** file.

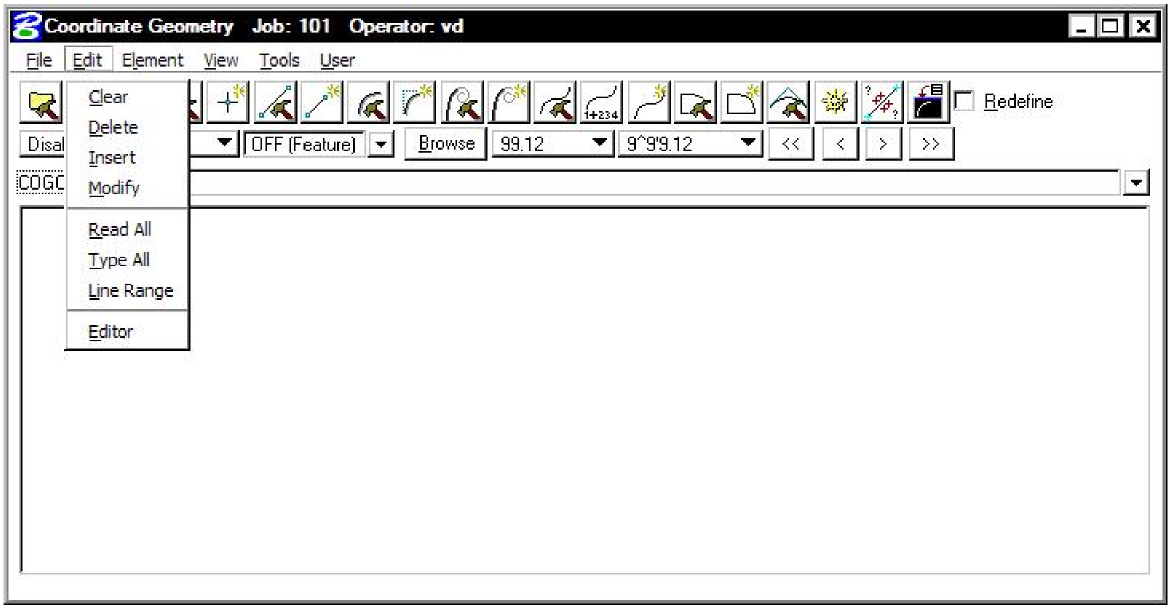
3.3.2 File Utility

The File Utility option invokes the following dialog box.



Load	When selected, a menu appears listing all saved input files. Highlight a file, then click the OK button. The input lines from the highlighted file are now displayed in the display window for viewing, editing, or processing.
Append	This command is for input files only. A new input file is created by copying the contents of an existing input file to the end of the current input file. The Save command must be used in order to store this new file.
Catalog	When selected, a menu appears listing all saved input files (under the current operator code) in the project directory. This is for reference only no action is taken.
Delete	When selected, a menu appears listing all saved input files. Highlight a file, then click the OK button to remove this file from your project directory. Although the file is deleted, the elements stored as a result of processing the commands are not deleted.
Output	Writes an ASCII file of the current display for reviewing and / or printing. (Fname999.ooc, where 999 is the current job number and oc is the operator code).
Print Input File	Sends your input file to the printer.
Print Output File	Sends your output file to the printer.
Save	Saves the current audit trail to a file. (Fname999.ioc, where 999 is the current job number and oc is the operator code.).
Allow Commands to be Added	When this is toggled on, COGO commands are added to a previously loaded file.

3.3.3 Edit Commands


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Clear
Delete
Insert
Modify
Read All
Type All
Line Range
Editor
1+234
☐ Redefine
Disal
OFF (Feature)
Browse
99.12
9^9'9.12
<<
<
>
>>
COGC

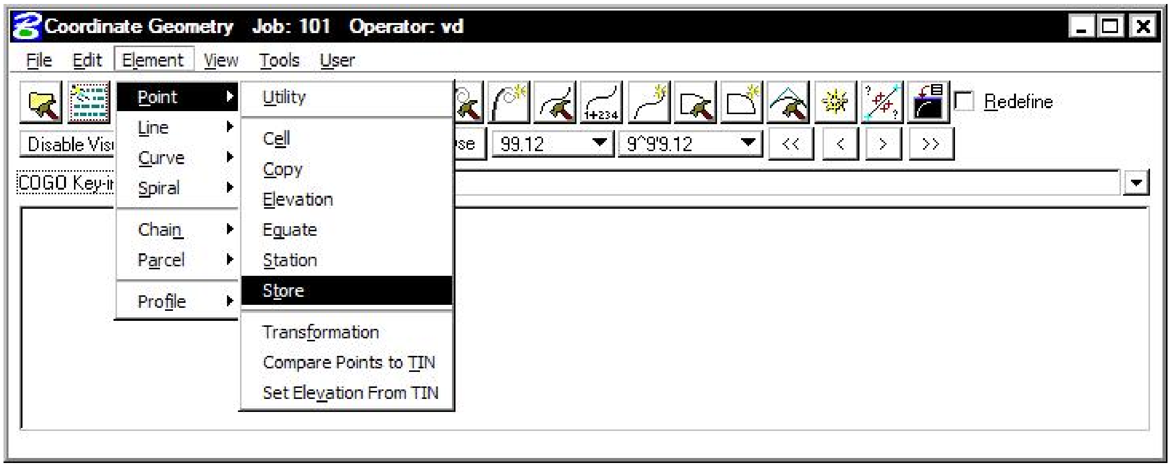
The Edit commands (as displayed in the exploded view above) are detailed in the table below.

Clear	Empties the memory of the current audit trail without saving and initializes the line numbers to begin a new sequence of commands**. Note this does not clear the display window.**
Delete	Deletes input commands in the input buffer by line number (or range of line numbers) and re-sequences the line numbers for the remaining commands.
Editor	Opens the GEOPAK COGO Command Editor, which enables the user to edit the current input file.
Insert	Adds a command line to the current input buffer *before* a specified line number; subsequent command lines shift down and line numbering is automatically re-sequenced.
Modify	Changes a fragment in a command line. The modified command line is not processed until a Read command is performed.
Read All	Processes the specified lines in the audit trail. This may be done for the entire file (All) or by specifying a range of line numbers (Line Range).
Type All	Displays the content of the audit trail, (All) or a portion of the audit trail by specifying a range of line numbers (Line Range).
Line Range	Allows you to specify a beginning line number and ending line number. This range of lines can then be either “read” into COGO or just typed/listed in the display window.
Editor	Opens the **COGO Command Editor**, which enables the user to edit the current input file.

3.3.4 Element Commands

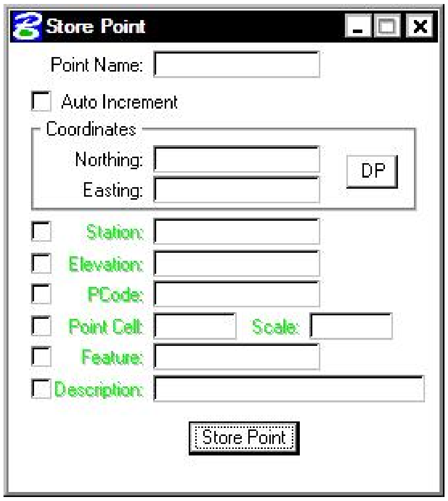
The mainstay of GEOPAK Coordinate Geometry are the various element commands. Tools are supported for storing, stationing, adding additional data, deleting, etc. GEOPAK supports a wide variety of elements: points, curves, spirals, chains or alignments, parcels, and profiles. Each element is detailed below.

3.3.4.1 Element > Point


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Point
Line
Curve
Spiral
Chain
Parcel
Profile
Utility
Cell
Copy
Elevation
Equate
Station
Store
Transformation
Compare Points to TIN
Set Elevation From TIN
☐ Redefine
Disable Visi
COGO Key-ir
se
99.12
9^9'9.12
<<
<
>
>>

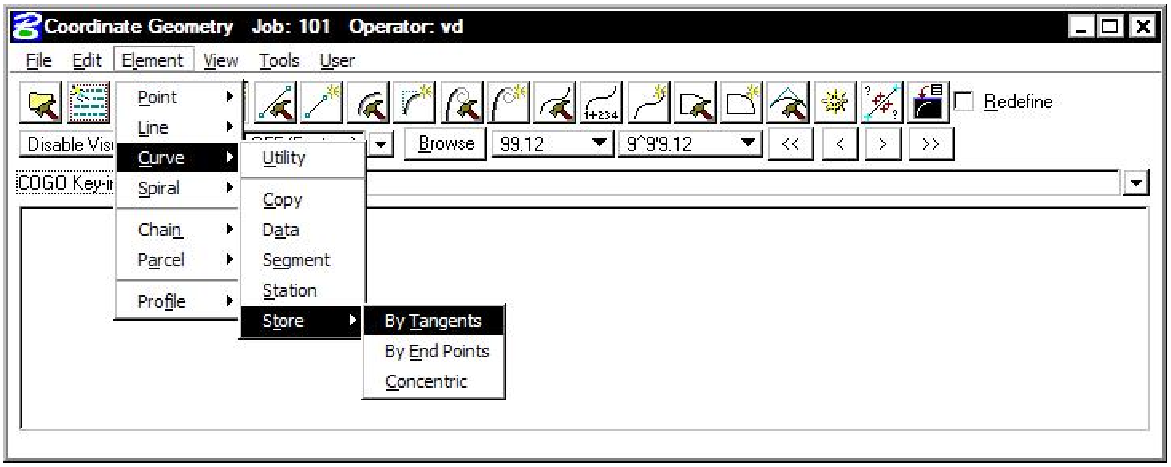
One of the most utilized sets of COGO tools are the point commands, as detailed in the table below.

Utility	Opens the **Point Utility** dialog box where the following options are available. **Delete -** Deletes a point number (or range of numbers) from the database file. **Print** - Displays the selected point numbers x, y, z coordinates, station value and other stored information in the display output window. **Display** - Visualizes the selected point numbers currently stored in the GPK file (Temporary Visualization or Permanent Visualization must be turned on).
Cell	Assigns a cell name to a previously stored point. This point and associated cell can then be plotted later through D&C Manager.
Copy	Copies points or a point range to a new point number or range within the same GEOPAK database file
Elevation	Assigns an elevation to a previously stored point
Equate	Stores a new point with the same values as a previously stored point
Station	Adds a station to a previously stored point.


Store Point
Point Name:
☐ Auto Increment
Coordinates
Northing:
Easting:
DP
☐ Station:
☐ Elevation:
☐ PCode:
☐ Point Cell:
Scale:
☐ Feature:
☐ Description:
Store Point

Store	Stores a point by key-in coordinates or by selecting a location graphically. A station, elevation, point code, cell, feature, or description can be optionally stored with the point.
Transformation	Performs coordinate transformations based on user-defined control pairings
Compare Points to TIN	Utilizing a set of COGO points (with elevations) compares the COGO elevation to the TIN elevation and completes statistical analysis for "goodness of fit."
Set Elevation from TIN	Utilizing this command, GEOPAK adds or updates an elevation to a previously defined point, based on a TIN model.

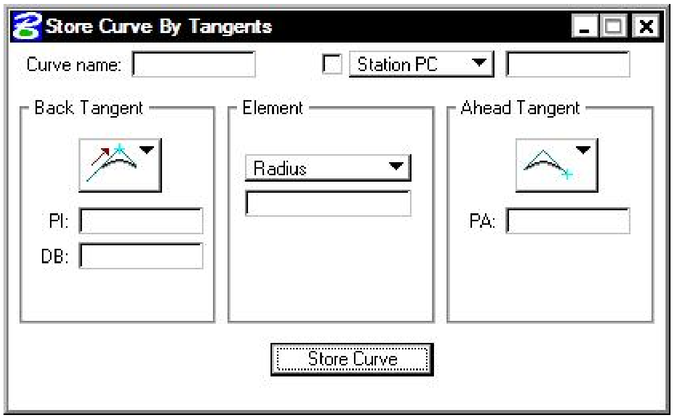
3.3.4.2 Element > Curve


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
☐ Redefine
Disable Visi
Browse
99.12
9^9'9.12
<<
<
>
>>
COGO Key-in
Point
Line
Curve
Spiral
Chain
Parcel
Profile
Utility
Copy
Data
Segment
Station
Store
By Tangents
By End Points
Concentric

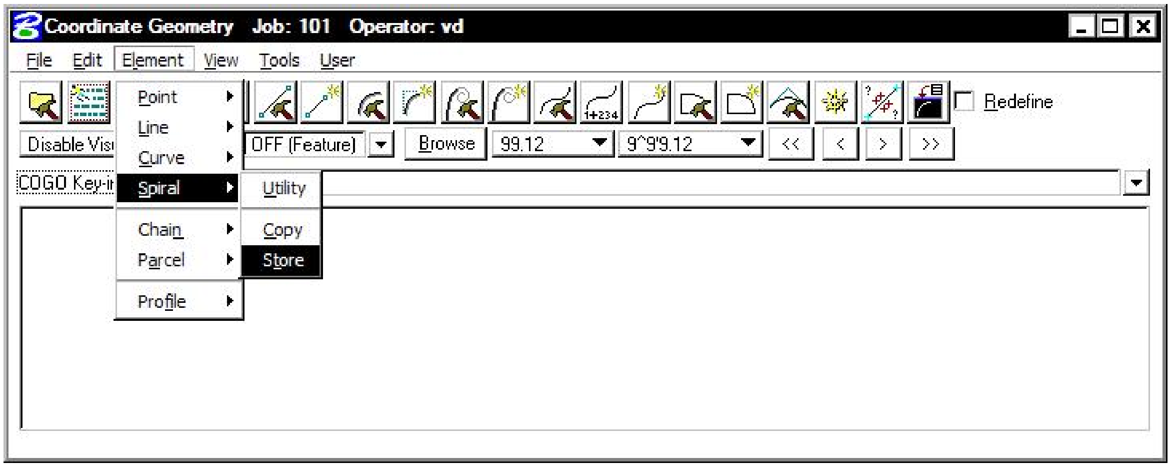
The Curve commands (as displayed above) are detailed in the table below.

Utility	Opens the **Curve Utility** dialog box were the following options are available. **Reverse** – Reverses a previously stored curves direction. **Delete -** Deletes a curve (or range of curves) from the database file. **Print** - Displays the selected curves x, y, z coordinates, station value and other stored information in the display output window. **Visualize** - Visualizes the selected curves currently stored in the GPK file (Temporary Visualization or Permanent Visualization must be turned on).
Copy	Copies a specified curve to another curve name.

Data	Calculates the geometric parameters of a curve, displaying values for Delta, Degree, Tangent, Length and Radius.
Segment	Defines new curves by dividing a stored curve into segments.
Station	By identifying a curve and a control point on the curve (PC, PI, or PT), a station value may be assigned.
Store	Provides various options for defining and storing lines and curves such as **Store Curve By Tangents** as shown below.

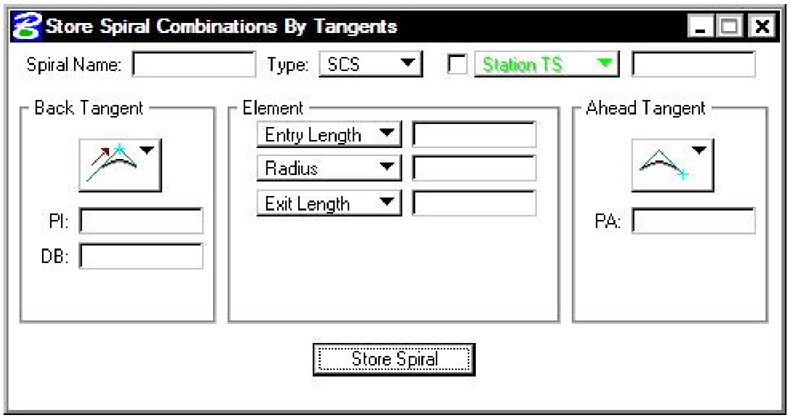

Store Curve By Tangents
Curve name:
Station PC
Back Tangent
PI:
DB:
Element
Radius
Ahead Tangent
PA:
Store Curve

3.3.4.3 Element > Spiral


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Point
Line
Curve
Spiral
Chain
Parcel
Profile
Utility
Copy
Store
Redefine
Disable Visi
OFF (Feature)
Browse
99.12
9^9'9.12
<<
<
>
>>
COGO Key-in

The Spiral commands (as displayed in the exploded view above) are detailed in the table below.

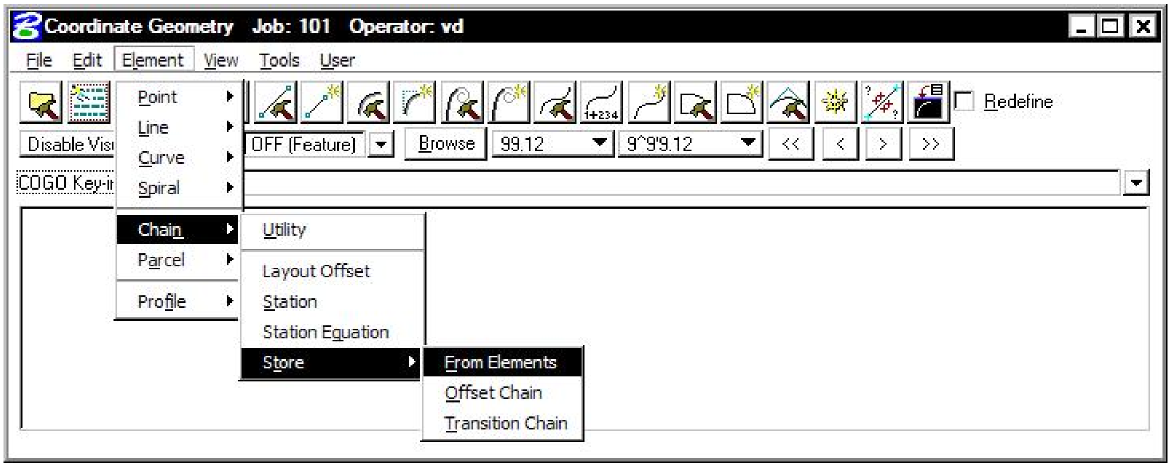
Utility	Opens the **Spiral Utility** dialog box where the following options are available. **Delete -** Deletes a spiral (or range of spirals) from the database file. **List/Print** - Displays the selected spirals x, y, z coordinates, station value and other stored information in the display output window. **Visualize** - Visualizes the selected spirals currently stored in the GPK file (Temporary Visualization or Permanent Visualization must be turned on).
Copy	Copies a specified spiral to another spiral name.
Store	Provides various options for defining and storing spirals.


Store Spiral Combinations By Tangents
Spiral Name:
Back Tangent
PI:
DB:
Element
Entry Length
Radius
Exit Length
Ahead Tangent
PA:
Store Spiral

Type: SCS

☐ Station TS

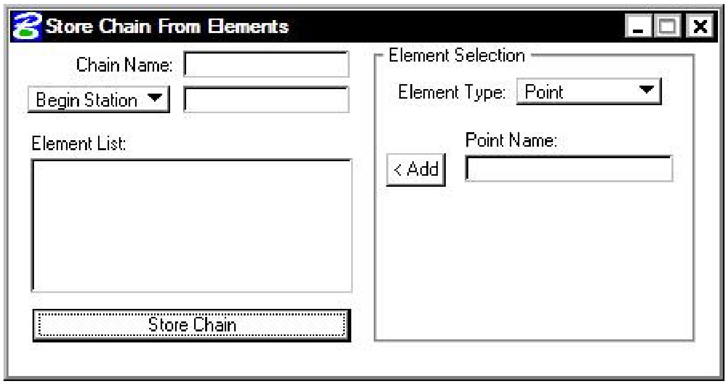
3.3.4.4 Element > Chain


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Point
Line
Curve
Spiral
Chain
Parcel
Profile
Utility
Layout Offset
Station
Station Equation
Store
From Elements
Offset Chain
Transition Chain
☐ Redefine
Disable Visi
OFF (Feature)
Browse
99.12
9^9'9.12
<<
<
>
>>
COGO Key-in

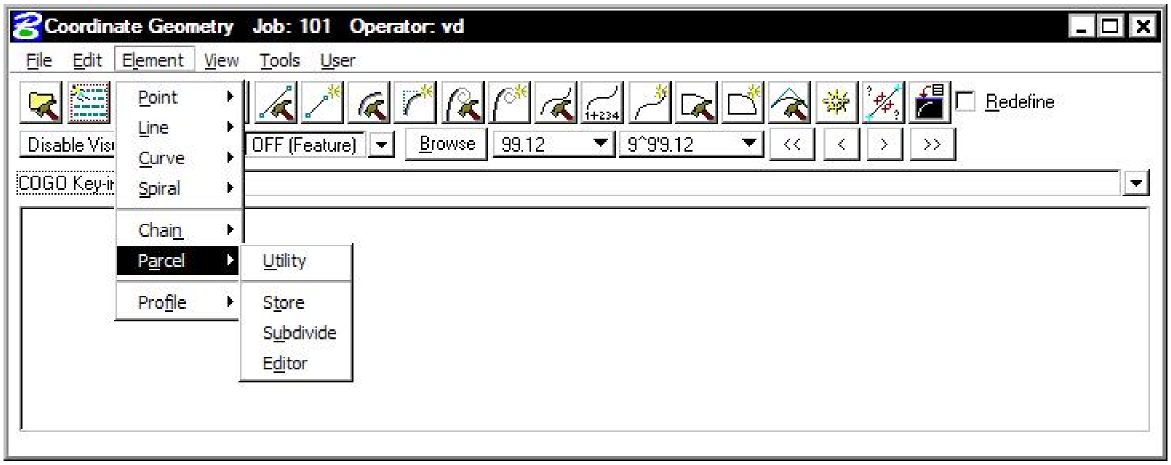
The Chain (GEOPAK alignment) commands (as displayed in the exploded view above) are detailed in the table below.

Utility	Opens the **Chain Utility** dialog box where the following options are available. **Area** - Calculates the area of a closed chain. **Delete -** Deletes a chain (or range of chains) from the database file. **Print** - Displays the name of each element in the selected chains. **Describe** - Displays the alignment data of each element in the selected chains. **Visualize** - Visualizes the selected spirals currently stored in the GPK file (Temporary Visualization or Permanent Visualization must be turned on).
Layout Offset	Project points onto a chain or compute offset distance and direction between two chains at each control point or at user defined intervals of a specified station range.
Station	Provides a method for stationing or re-stationing a chain.

Station Equation	Provides a method for applying a station equation to a chain.
Store	Provides three options for storing a chain in the database file, **From Elements**, **Store Offset Chain** and **Store Transition Chain.** The **Store Chain From Elements** dialog box is shown below. (Chain name can be between 1-9 alphanumeric characters)


Store Chain From Elements
Chain Name:
Begin Station
Element List:
Store Chain
Element Selection
Element Type:
Point
Point Name:
< Add

3.3.4.5 Element > Parcel


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Point
Line
Curve
Spiral
Chain
Parcel
Profile
Utility
Store
Subdivide
Editor
Disable Visi
OFF (Feature)
Browse
99.12
9^9'9.12
<<
<
>
>>
COGO Key-in
1+234
☐ Redefine

The Parcel commands (as displayed in the exploded view above) are detailed in the table below.

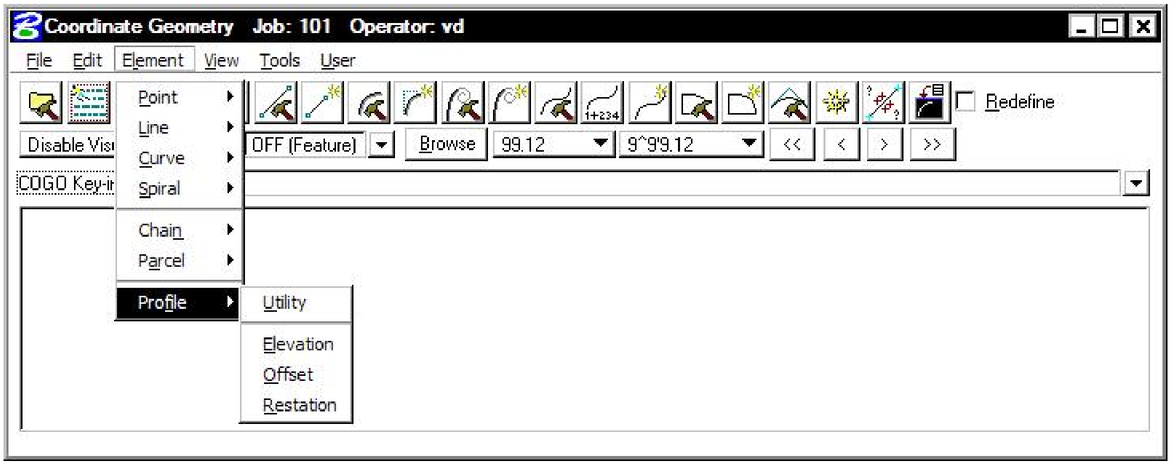
Utility	Opens the **Parcel Utility** dialog box where the following options are available. **Delete** - Deletes a parcel (or range of parcels) from the database file. **Print** - Displays the elements of composition, the area of tract stored, taken and remaining. **Describe** - Displays the elements of composition, the area of tract stored, taken and remaining and a point, bearing, distance description of the specified tract. **Visualize** - Visualizes the selected parcels currently stored in the GPK file (Temporary Visualization or Permanent Visualization must be turned on).
Store	Stores a parcel by adding points, curves and spirals.
Subdivide	Divides a parcel into individual lots.
Editor	Edits a parcel.

3.3.4.6 Parcel Commands (Manual Entry)

Several parcel commands are supported only by manual entry and have no associated dialog boxes.

Store Taken	Store the portion of a parcel taken by entering point and curve names in either a clockwise or counterclockwise direction.
Store Easement	Store easements by entering point and curve names in either a clockwise or counterclockwise direction.
Own Parcel	Stores the names of the owners associated with previously stored parcels.
Make Legal	Creates a metes and bounds description and writes it to a user named text file. See also *Legal Description Editor* for the ability to create detailed and customizable legal descriptions.

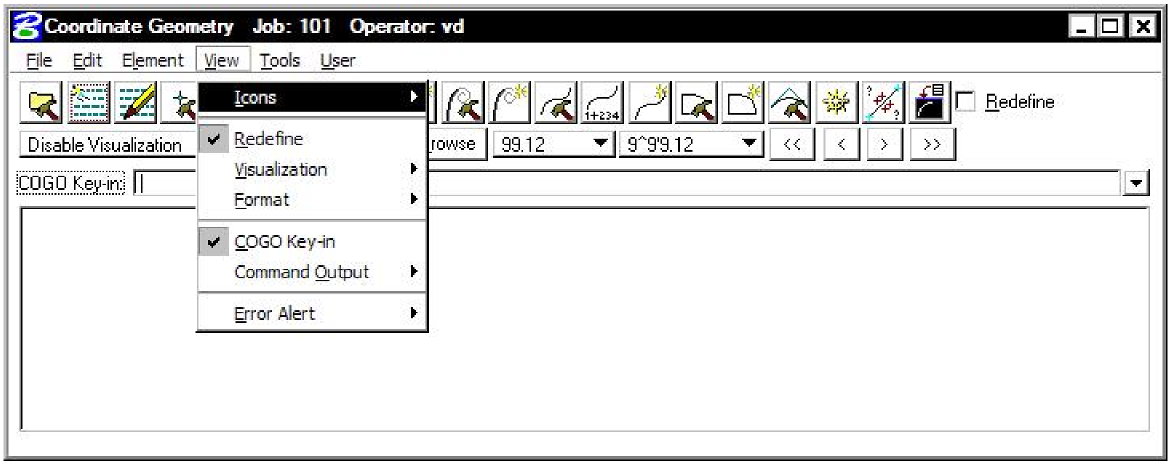
3.3.4.7 Element > Profile


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Point
Line
Curve
Spiral
Chain
Parcel
Profile
Utility
Elevation
Offset
Restation
Redefine
Disable Visi
OFF (Feature)
Browse
99.12
9^9'9.12
<<
<
>
>>
COGO Key-ir

The Profile commands (as displayed in the exploded view above) are detailed in the table below. **Note additional commands are supported as keyin only commands.**

Utility	Opens the **Profile Utility** dialog box where the following options are available. **Delete -** Deletes a profile (or range of profiles) from the database file. **Print** - Displays the data of the selected profile from the database file.
Elevation	Provides three options for reporting elevations along a selected profile, **Station**, **Even Station, Incremental Stations.**
Offset	Stores a new profile within a specified Station Range at a defined vertical offset from the original profile.
Restation	Creates a new profile with different stationing from a previously stored profile.

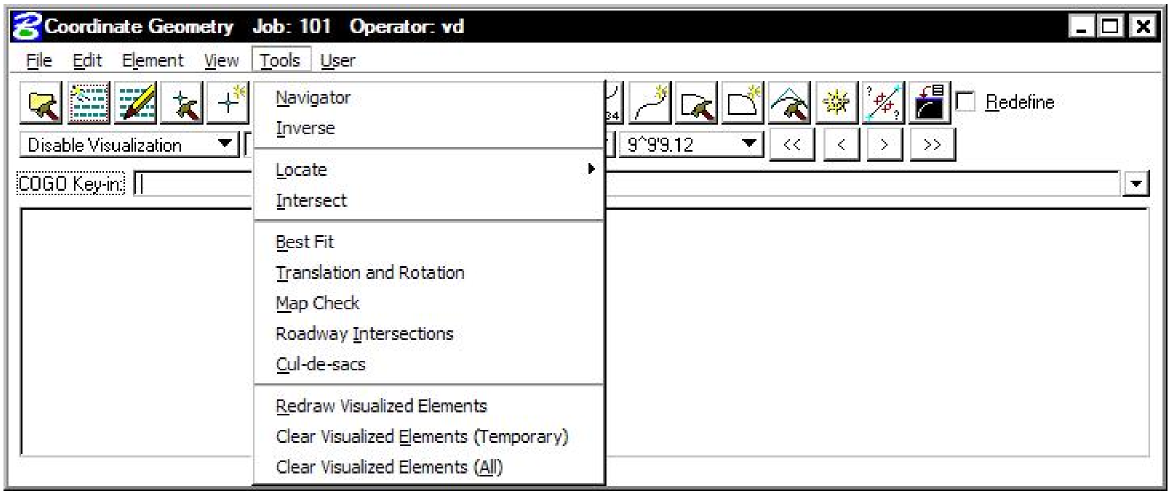
3.3.5 View Commands


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Icons
Redefine
Visualization
Format
COGO Key-in
Command Output
Error Alert
Redefine
Disable Visualization
rowse
99.12
9^9'9.12
COGO Key-in:

The View commands (as displayed in the exploded view above) are detailed in the table below.

Icons	Enables the user to customize which icons appear in the tool bar.
Redefine	Displays the **Redefine** box on the tool bar.
Visualization	Displays the visualization items on the tool bar.
Format	Displays the format items (i.e. number of decimals, station format, etc.) on the tool bar.
COGO Key-in	Displays the COGO Key-in box for entering commands in the dialog box.
Command Output	Displays the Command Output Window in the dialog box, and controls options for the Command Output Window. The Command output window can also be saved to a text file in lieu of using the File > Output command.
Error Alert	Enables the user to activate a *beep* and/or restore a minimized COGO dialog box when an error occurs.

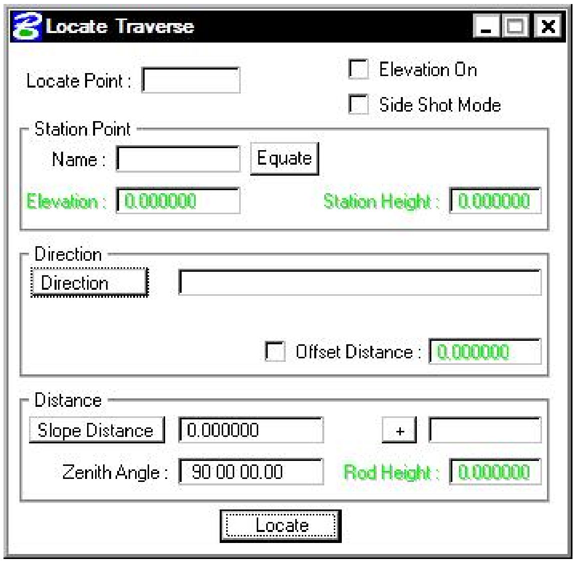
3.3.6 Tools Commands


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Navigator
Inverse
Locate
Intersect
Best Fit
Translation and Rotation
Map Check
Roadway Intersections
Cul-de-sacs
Redraw Visualized Elements
Clear Visualized Elements (Temporary)
Clear Visualized Elements (All)
Redefine
Disable Visualization
9^9'9.12
COGO Key-in:

The Tools commands are detailed in the table below.

Navigator	Invokes the COGO Navigator. See Section 3.4.

Inverse	Calculates the distance and direction between points.
Locate	Stores a point or series of points not by specifying coordinates, but based on a previously stored point using several methods. To locate a point by distance and bearing, use the **Tools > Locate > Traverse** as depicted in the dialog box below.


Locate Traverse
Locate Point :
☐ Elevation On
☐ Side Shot Mode
Station Point
Name :
Equate
Direction
Direction
Distance
Slope Distance
+
Locate

Elevation : 0.000000

Station Height : 0.000000

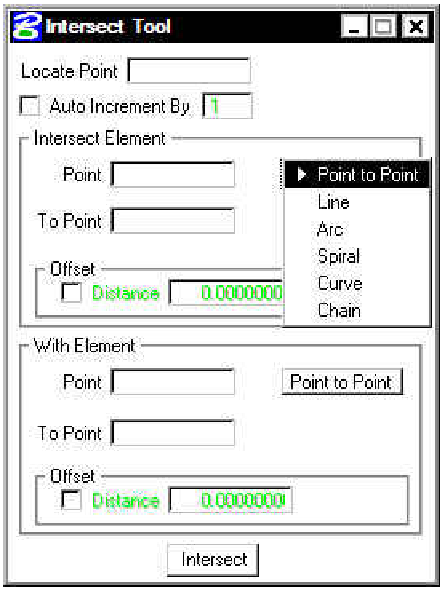
☐ Offset Distance : 0.000000

Slope Distance 0.000000

Zenith Angle : 90 00 00.00

Rod Height : 0.000000

Intersect	Stores a point at the intersection of any two COGO elements.


Intersect Tool
Locate Point
Intersect Element
Point
To Point
Offset
Point to Point
Line
Arc
Spiral
Curve
Chain
With Element
Point
Point to Point
To Point
Offset
Intersect

☐ Auto Increment By 1

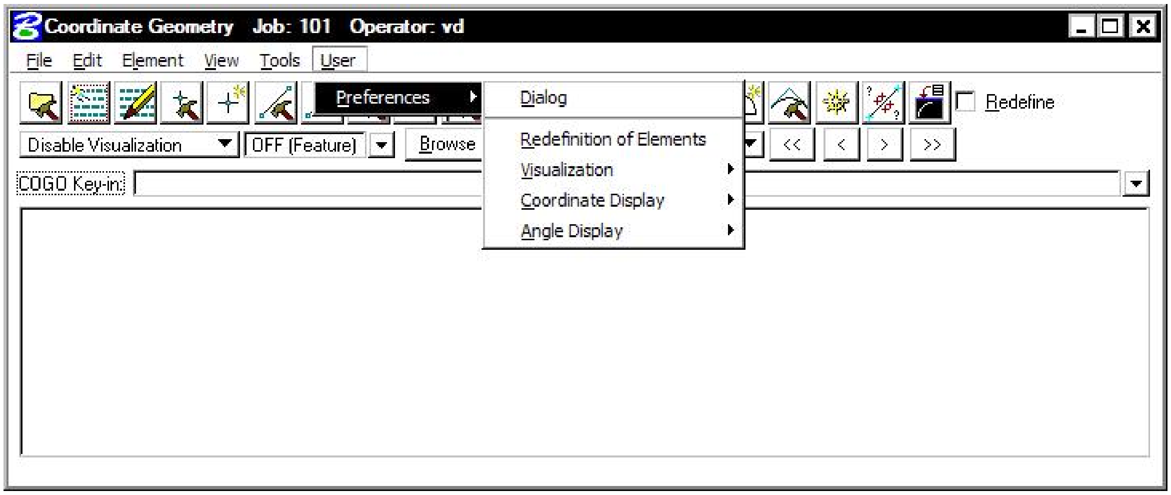
☐ Distance 0.0000000

☐ Distance 0.0000000

Best Fit	Calculates a best-fit chain through a set of points.
Translation and Rotation	Moves, rotates, and scales a data set.
Map Check	Edits a parcel.
Roadway Intersections	Calculates data for the intersection of two COGO elements, usually chains.
Cul-de-sacs	Calculates data for a cul-de-sac.
Redraw Visualized Elements	Re-syncs the visualized COGO elements in the MicroStation file with the coordinate geometry data.

Clear Visualized Elements (Temporary)	Removes all temporary visualized elements from the view.
Clear Visualized Elements (All)	Clears all temporary and permanent visualized elements from the Microstation file.

3.3.7 User Preferences


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Preferences
Dialog
Redefinition of Elements
Visualization
Coordinate Display
Angle Display
☐ Redefine
Disable Visualization
OFF (Feature)
Browse
<<
<
>
>>
COGO Key-in:

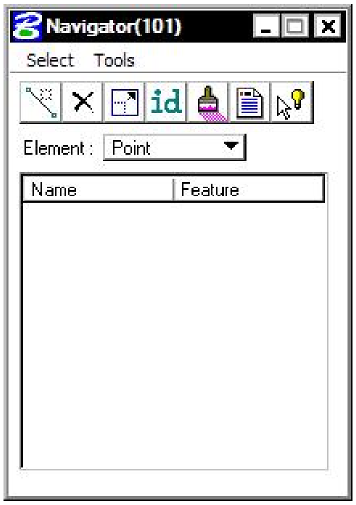
The User Preferences (as displayed in the exploded view above) are detailed in the table below.

Dialog	Allows access to COGO Preferences dialog box.
Redefinition of Elements	Toggles the Redefine option on/off. If Redefine is on, COGO data can be redefined/overwritten.
Visualization	Enables the elements to be displayed in the MicroStation file permanently, temporarily, or not at all.
Coordinate Display	Toggles between displaying NE or XY coordinates.
Angle Display	Toggles between displaying Bearing or Azimuth.

3.4 COGO Navigator

Feature / Function	View, edit and display COGO elements.
Tools	☼
COGO Menu Bar	Tools > Navigator

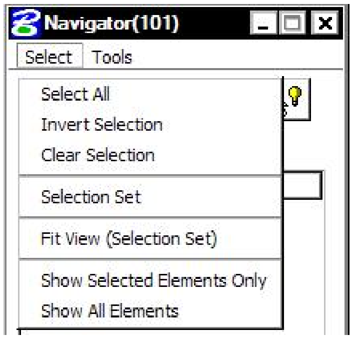
The **COGO Navigator** is a tool utilized to easily view and edit COGO data. Store, delete, edit, print elements, plus visualization and selection set commands are easily accessible via the Navigator. The **Navigator** can be accessed by the pull down menu **COGO > Tools > Navigator** or by the **Navigator** icon. The following dialog box opens.



From the **Navigator**, points, curves, spirals, chains, survey chains, parcels, and profiles (all COGO elements contained in the coordinate geometry database file; *.gpk) can be added, deleted, modified, identified, visualized, printed, or selected.

3.4.1 Navigator > Select Tools

A variety of selection tools can be invoked via the Select pulldown, as depicted in the exploded view below.

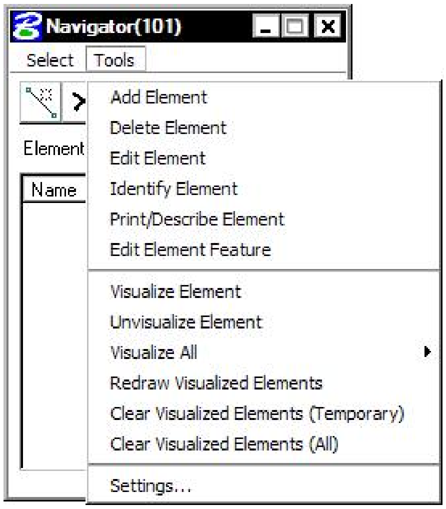

Navigator(101)
Select
Tools
Select All
Invert Selection
Clear Selection
Selection Set
Fit View (Selection Set)
Show Selected Elements Only
Show All Elements

The Select tools are detailed in the table below.

Select All	Selects all data items of a certain type. (i.e. all points)
Invert Selection	Selects all items not previously selected, and unselects all items previously selected.
Clear Selection	Unselects all items.
Selection Set	Allows the user to create a selection set that meets particular criteria. Same as using the **Selection Set** icon
Fit View (Selection Set)	Fits the selected items to the active MicroStation window.
Show Selected Elements Only	Only the items in the selection set are displayed in the MicroStation window.
Show All Elements	All items in database file are displayed in the MicroStation window.

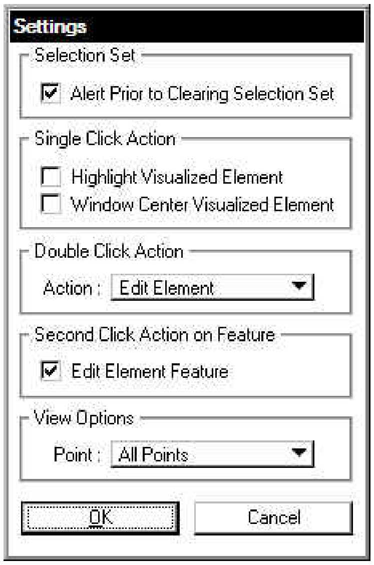
3.4.2 Navigator > Tools

A variety of tools can be invoked via the Tools pulldown, as depicted in the exploded view below. Many can also be invoked via the shortcut icons displayed at the top of the Navigator.


Navigator(101)
Select
Tools
Element
Name
Add Element
Delete Element
Edit Element
Identify Element
Print/Describe Element
Edit Element Feature
Visualize Element
Unvisualize Element
Visualize All
Redraw Visualized Elements
Clear Visualized Elements (Temporary)
Clear Visualized Elements (All)
Settings...

Add Element	Enables the selected type of element to be stored. When selected, the appropriate Store Element dialog box is invoked.
Delete Element	Deletes the highlighted element.
Edit Element	Invokes the appropriate Store Element dialog box, populated with the associated data of the selected element for editing.
Identify Element	When clicked and a COGO element is graphically selected, the element is highlighted in the display field. If the selected element is not the displayed element type (i.e., curve or point), the element type is also changed.
Print/Describe Element	Displays the selected element's data.
Edit Element Feature	Changes the feature code of the element.
Visualize Element	Displays the selected elements according to their feature code or default symbology.
Unvisualize Element	Removes display of selected elements.
Visualize All	Displays all of the elements of a certain type, or all elements.
Redraw Visualized Elements	Re-syncs the coordinate geometry data with the data displayed in the MicroStation file.
Clear Visualized Elements (Temporary)	Clears only temporary visualized elements from the view.
Clear Visualized Elements (All)	Clears all visualized elements from the MicroStation file.

Settings Enables the user to define certain actions and behaviors of the Navigator.



Settings

Selection Set

☑ Alert Prior to Clearing Selection Set

Single Click Action

☐ Highlight Visualized Element

☐ Window Center Visualized Element

Double Click Action

Action : Edit Element

Second Click Action on Feature

☑ Edit Element Feature

View Options

Point : All Points

LAB 3: Coordinate Geometry

3.1 Accessing COGO

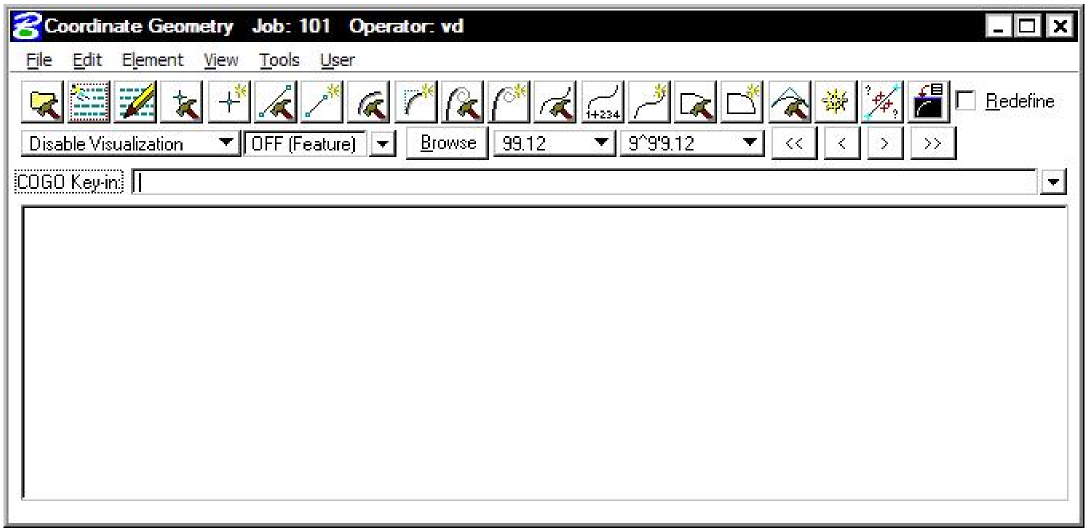
Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB3.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682des.dgn**.

Access **Project Manager**. It should automatically access the Road workflow dialog box since we “remembered” the options in Exercise 2.

Step 3. Select the **Coordinate Geometry** icon from the **Road Project: 17682.prj** workflow dialog box.

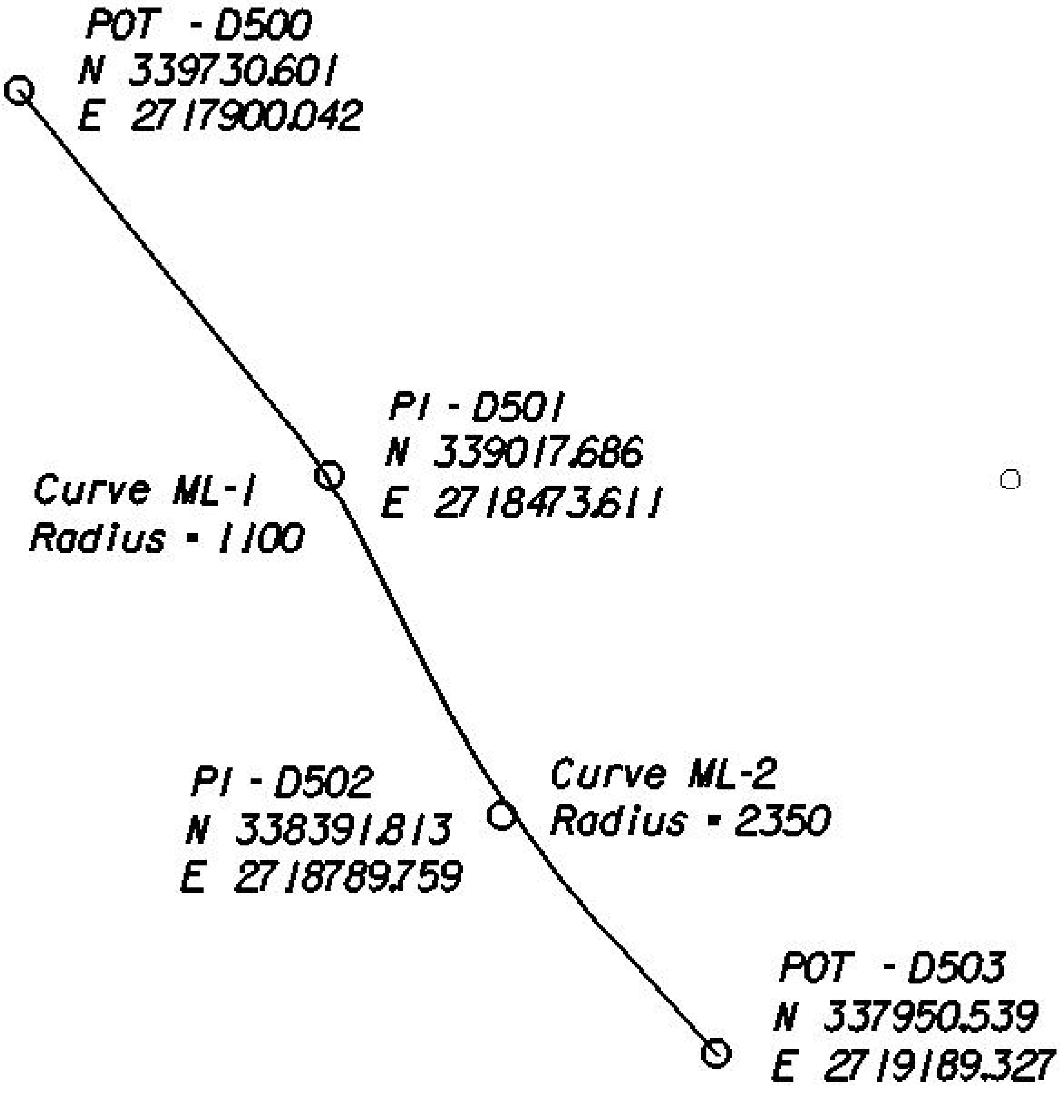
The following **COGO** dialog box opens.


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
☐ Redefine
Disable Visualization
OFF (Feature)
Browse
99.12
9^9'9.12
<<
<
>
>>
COGO Key-in:

This dialog box is completely re-sizable, so you can position it where you’re most comfortable.

3.2 Store Geometry

Our course project has 3 alignments. We'll store two of them using Coordinate Geometry. The first alignment will be called **MAINLINE** and is shown below:

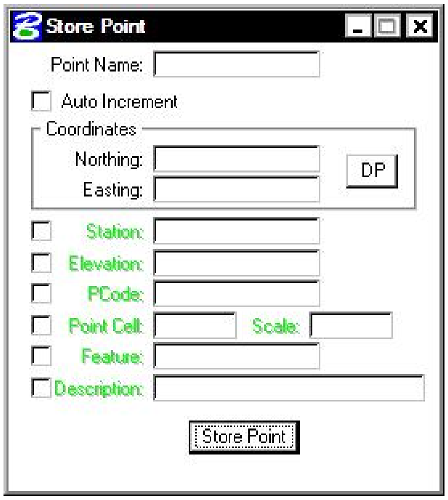

POT - D500
N 339730.601
E 2717900.042
PI - D501
N 339017.686
E 2718473.611
Curve ML-1
Radius = 1100
PI - D502
N 338391.813
E 2718789.759
Curve ML-2
Radius = 2350
POT - D503
N 337950.539
E 2719189.327

3.2.1 Store Points

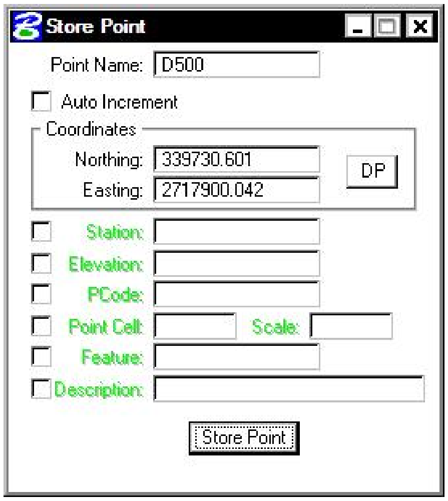
Step 1. Select the visualization option **Permanent Visualization** on the main COGO dialog box.

Step 2. Access the Store Point dialog box by pressing the **Store Point** icon

or using the **Element > Point > Store** pulldown.


Store Point
Point Name:
☐ Auto Increment
Coordinates
Northing:
Easting:
DP
☐ Station:
☐ Elevation:
☐ PCode:
☐ Point Cell:
Scale:
☐ Feature:
☐ Description:
Store Point

Step 3. To store point **D500**, manually enter the point number and coordinates as indicated in the dialog box below. Activate the **Auto Increment** toggle which will automatically increment the point number by 1 for subsequent Store Point commands.


Store Point
☐ Auto Increment
Coordinates
DP
☐ Station:
☐ Elevation:
☐ PCode:
☐ Point Cell:
Scale:
☐ Feature:
☐ Description:
Store Point

Point Name: D500

Northing: 339730.601

Easting: 2717900.042

Step 4. Press the **Store Point** button to store the point into the COGO database.

Step 5. Continue storing points **D501-D503** by utilizing the coordinates shown on the alignment diagram. When complete, exit the Store Point dialog box by pressing the "**X**" in the upper right hand corner.

Note that the following point naming conventions should be followed:
Design – All points should begin with **D** (e.g. D501, D502, etc.).
Hydraulic – All points should begin with **H** (e.g. H501, H502, etc.)
Survey – All points should begin with **S** (e.g. S501, S502, etc.)
Traffic – All points should begin with **T** (e.g. T501, T502, etc.)
Right of Way – All points should begin with **R** (e.g. R501, R502, etc.)
Environmental – All points should begin with **E** (e.g. E501, E502, etc.)
Utilities - All points should begin with **U** (e.g. U501, U502, etc.)

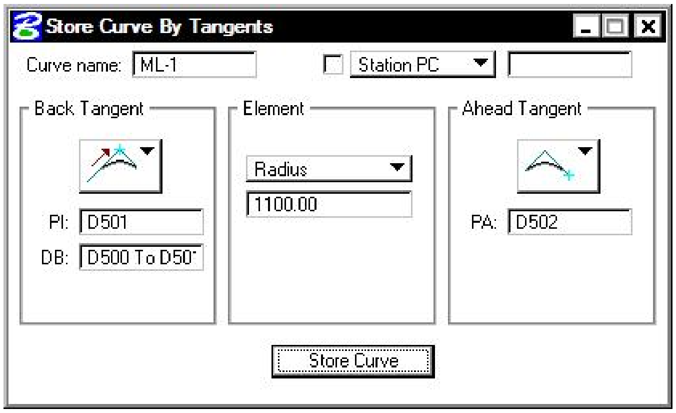
3.2.2 Store Curves

Step 1. Access the **Store Curve from Tangents** dialog box by pressing the Store Curve from Tangents icon

or select **Elements > Curve > Store > By Tangents** from the COGO menu bar.

Step 2. To store **Curve ML-1**, complete the dialog box as shown below and press **Store Curve**.

NOTE**:** Pressing the "picture" buttons allows you to select from multiple methods of defining the Back and Ahead Tangents

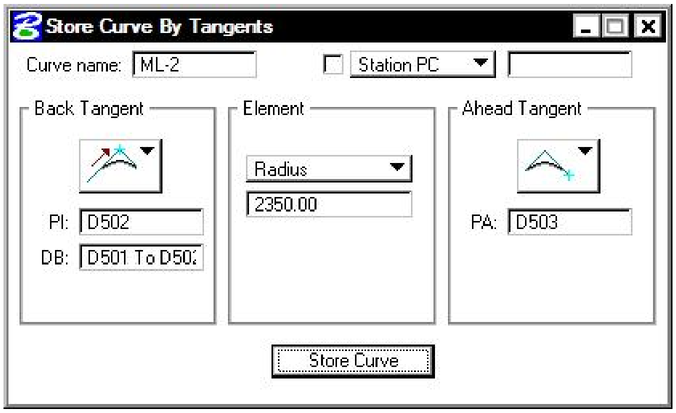


Curve name: ML-1
☐ Station PC
PI: D501
DB: D500 To D50
Radius
1100.00
PA: D502

DB: D500 To D501

Step 3. To store **Curve ML-2**, complete the dialog box as shown below and press **Store Curve**.

NOTE**:** Visualized points may be selected to complete any field that requires defined points or directions.


Store Curve By Tangents
Back Tangent
Element
Ahead Tangent
Store Curve

Curve name: ML-2

☐ Station PC

Radius: 2350.00

PI: D502

DB: D501 To D50:

PA: D503

DB: D501 To D502

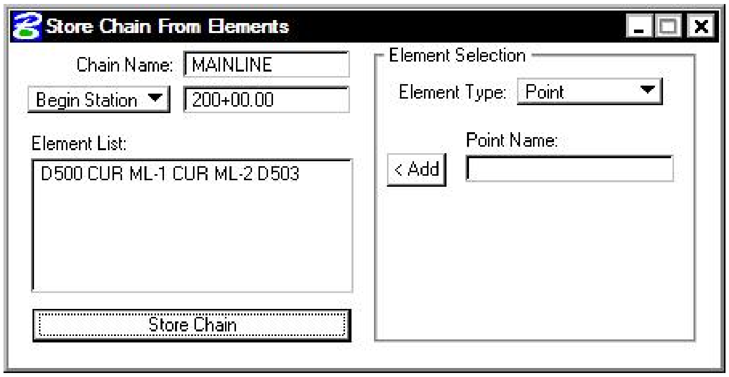
Step 4. Dismiss the Store Curve from Tangents dialog box by pressing the "**X**" in the upper right hand corner.

3.2.3 Store Chain

Step 1. Invoke the **Store Chain From Elements** dialog box by pressing the Store Chain From Elements icon

or select **Element > Chain > Store > From Elements** from the COGO menu bar.

Step 2. Fill in the dialog box as shown below.


Store Chain From Elements
Element Selection
< Add
Store Chain

Chain Name: MAINLINE

Begin Station: 200+00.00

Element List: D500 CUR ML-1 CUR ML-2 D503

Element Type: Point

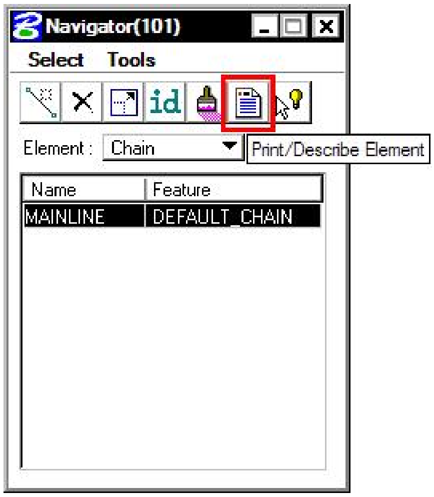
Point Name:

NOTE**:** You can enter the elements manually or select the visualized elements graphically in order to fill in the dialog box.

Step 3. Press **Store Chain** and dismiss the Store Chain dialog box. The chain **MAINLINE** should be visualized in the design file.

3.2.4 Describe Chain

From the COGO dialog window, let’s preview the geometry of the chain we just stored.


Navigator(101)
Select
Tools
Print/Describe Element
Element :
Chain
Name
Feature
MAINLINE
DEFAULT_CHAIN

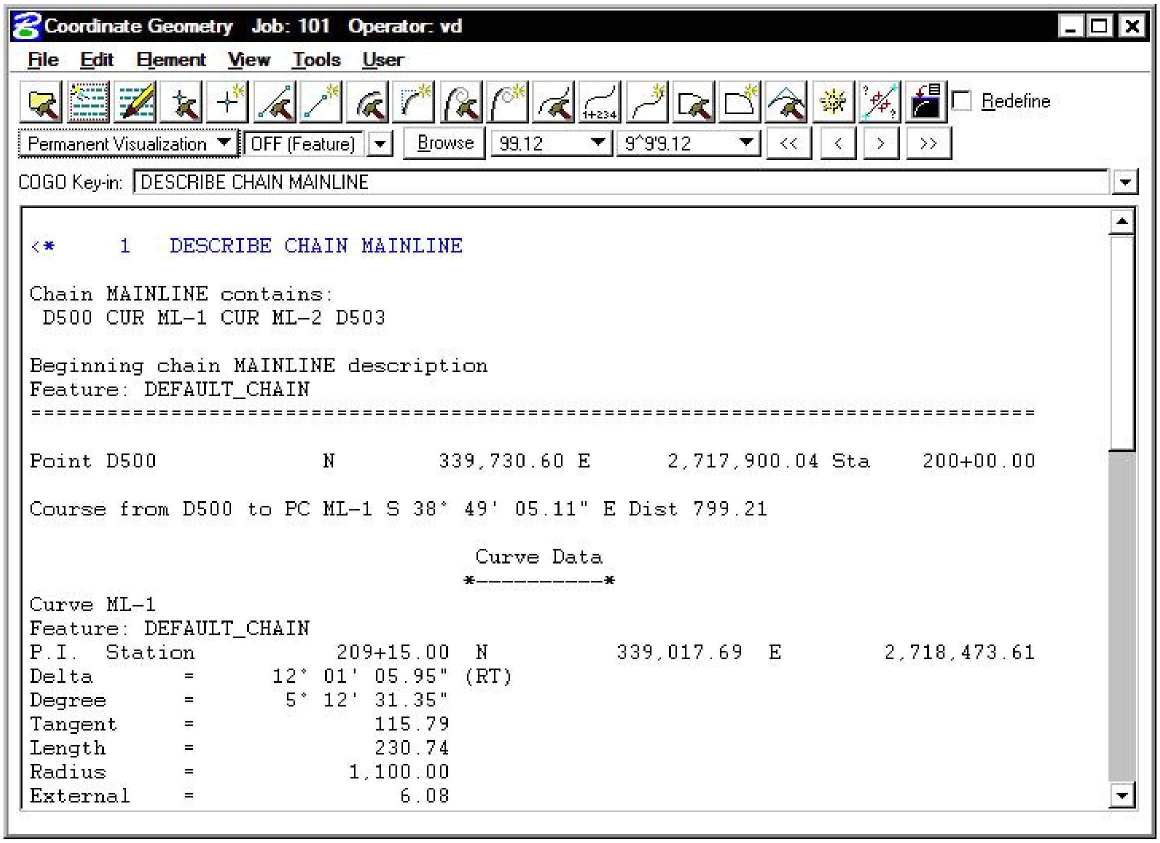
Step 1. Select the COGO **Navigator** icon

or use the **Tools > Navigator** option on the COGO menu bar to access the COGO Navigator dialog box.

Step 2. Set the element option to **Chain** and highlight the chain **MAINLINE.**

Step 3. Press the “**Print/Describe Element**” icon.

Step 4. The chain geometry output will be displayed in the main COGO window.


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
☐ Redefine
Permanent Visualization
OFF (Feature)
Browse
99.12
9^9'9.12
<<
<
>
>>
COGO Key-in:
DESCRIBE CHAIN MAINLINE

```
<*     1   DESCRIBE CHAIN MAINLINE

Chain MAINLINE contains:
 D500 CUR ML-1 CUR ML-2 D503

Beginning chain MAINLINE description
Feature: DEFAULT_CHAIN
================================================================================

Point D500             N        339,730.60 E      2,717,900.04 Sta    200+00.00

Course from D500 to PC ML-1 S 38° 49' 05.11" E Dist 799.21

                                  Curve Data
                                 *-----------*
Curve ML-1
Feature: DEFAULT_CHAIN
P.I.  Station           209+15.00  N         339,017.69  E        2,718,473.61
Delta        =      12° 01' 05.95" (RT)
Degree       =       5° 12' 31.35"
Tangent      =             115.79
Length       =             230.74
Radius       =           1,100.00
External     =               6.08
```

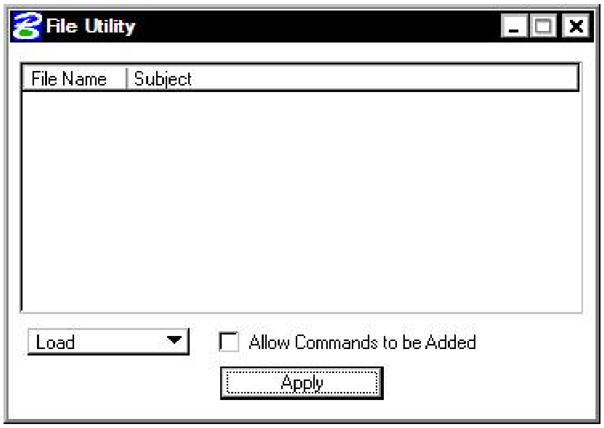
Step 5. Dismiss the **COGO Navigator** dialog box by clicking the “**X**” in the upper right hand corner.

4.2.5 Create Input and Output Files

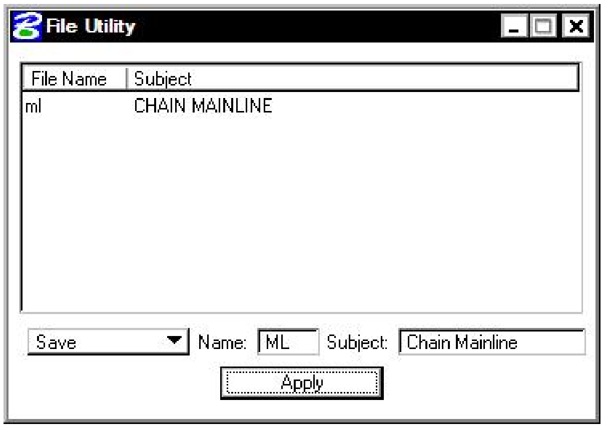
In the following steps we will save an input trail of our commands and an output file with the computations of chain **MAINLINE**.

Step 1. Access the **File Utility** dialog by pressing the **File Utility** icon

or by selecting **File > File Utility**. The dialog box below should appear.


File Utility
File Name
Subject
Load
☐ Allow Commands to be Added
Apply

Step 2. On the **File Utility** dialog box, set the option button to **Save**.

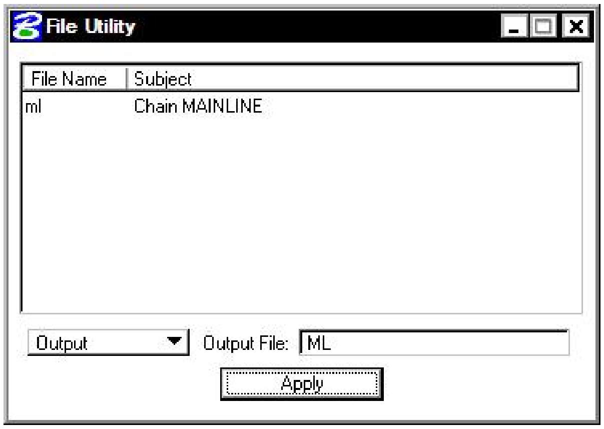

File Utility
File Name
Subject
Save
Apply

File Name	Subject
ml	CHAIN MAINLINE

Name: ML
Subject: Chain Mainline

Step 3. Enter "**ML**" for the **Name** and **"Chain MAINLINE"** for the **Subject** then click **Apply**. The saved file will be called '**ML101.ivd**'

Step 4. To save an output file with the actual results of the computations, set the option button to **Output** on the **File Utility** dialog.



ml Chain MAINLINE

Output

Output File: ML

Step 5. **Output File** should be set to “**ML**”. Click **Apply**. The saved file will be called **‘ML101.ovd’**.

Step 6. Dismiss the **File Utility** dialog by clicking the **X** in the upper right hand corner.

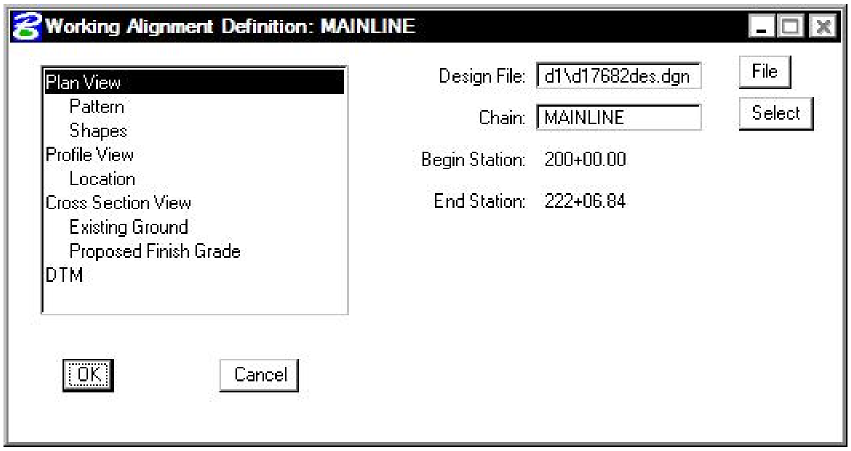
3.3 Working Alignment

Now that we have our alignment, we have another piece of information for the Working Alignment definition.

Step 1. Access the Project Manager Road workflow dialog box.

Step 2. Click the **Define** button to access the Working Alignment Definition dialog box.

Step 3. Highlight the **Plan View** option and use the **File** and **Select** buttons to populate the Design File and Chain fields as shown:



Working Alignment Definition: MAINLINE

Design File: d1\d17682des.dgn

Chain: MAINLINE

Begin Station: 200+00.00

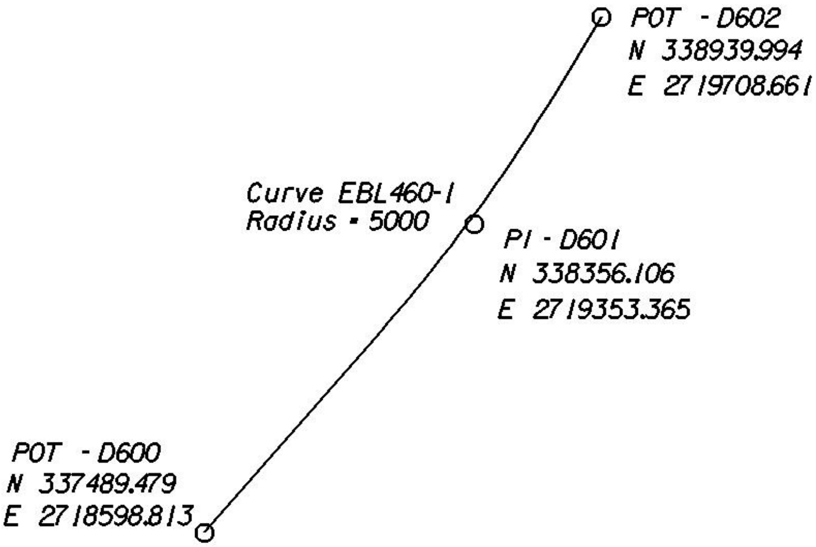
End Station: 222+06.84

Plan View
Pattern
Shapes
Profile View
Location
Cross Section View
Existing Ground
Proposed Finish Grade
DTM
File
Select
OK
Cancel

Step 4. Click **OK**.

3.4 Store Another Alignment

Using the same general steps we learned in storing the previous alignment, use the diagram below to store another chain ‘**EBL460**’. The beginning station of the chain will be **107+00**.



POT - D602
N 338939.994
E 2719708.661
Curve EBL460-1
Radius = 5000
PI - D601
N 338356.106
E 2719353.365
POT - D600
N 337489.479
E 2718598.813

Save an input trail of your commands.

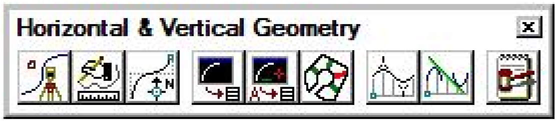
Exit COGO.

Exit MicroStation.

CHAPTER 4

Graphical COGO

4.1 Introduction

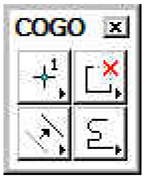
Objectives	Create and store COGO elements using Graphical Coordinate Geometry tools
Project Manager	Coordinate Geometry
Tool	 Horizontal & Vertical Geometry
Menu Bar Application	GEOPAK Road > Geometry > Graphical Coordinate Geometry

Graphical Coordinate Geometry is a tool that allows the user the ability to store coordinate geometry elements into the COGO database (GPK file) graphically. Points, curves, lines, spirals, chains, and parcels can be stored, modified, or deleted. The COGO elements can be manipulated by key-in or a click of the mouse and are stored directly into the COGO database.

! Note: Graphical Coordinate Geometry does not read the exclusive MicroStation graphics.

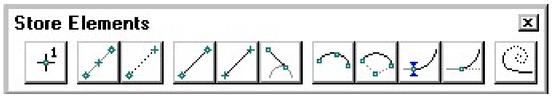
! NOTE**:** When **Graphical COGO** is invoked, a session of COGO will be started automatically.

When Graphical COGO is selected, the main COGO dialog box will appear as below.



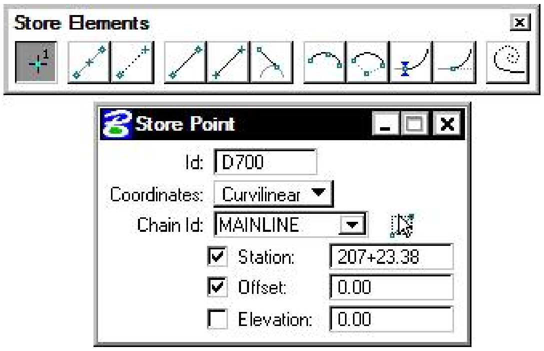
4.2 Store Elements

The Store Elements tool box contains eleven icons.



As elements are stored, the visualization parameters in the SMD file (as defined in the user parameters) are utilized. This assumes that the temporary or permanent visualization is activated. If no visualization is active, no elements are visualized.

When a Store Element command is selected, a sub pallet will appear to allow the user to enter data if necessary as depicted below.



Id: D700
Coordinates: Curvilinear
Chain Id: MAINLINE
☑ Station: 207+23.38
☑ Offset: 0.00
☐ Elevation: 0.00

The **Store Elements** commands are detailed in the table below.

Store Point

The Store Point tool enables the user to store points utilizing Cartesian coordinates (x, y, z or N, E, Z) or Curvilinear (station, offset, elevation).

Store Equally Spaced Points

The Store Equally Spaced Points stores a user-defined number of points between two previously defined points or any two data points. A line drawn between the two previously defined points is not necessary.

Locate Point

The Locate Point command stores a point based on the distance and direction from a previously defined visualized point.

Store Line From Existing Points

The Store Line from Existing Points utilizes two previously stored points to store a line.

Store Line By 2 Points

In contrast to the Store Line by Existing Points, the store line by two points command requires two new points, rather than existing points. The command stores the line and the new points, utilizing the "next" available point and line names.

Store Tangent Line

The Store Line Tangent To Element tool stores a line and its two endpoints in the coordinate geometry database.

Store Curve By 3 Points

The Store Circular Curve by Three Points tool stores a circular curve (using chord definition). The stationing is set to 0+00 at the P.C. The Radius can be manually typed in or defined dynamically.

Store Curve By Center

This tool enables the user to store a circular curve by defining the center point, radius, and sweep angle.

Store Tangent Curve Constrained

The Store a Constrained Tangent Curve tool places a curve tangent to the specified curve or line.

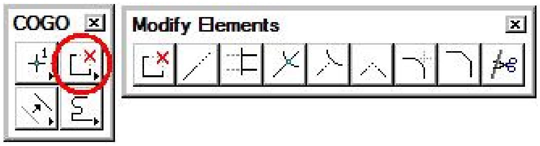
Store Tangent Curve Unconstrained

The Store an Unconstrained Tangent Curve tool places a curve through a specified point tangent to the specified curve or line.

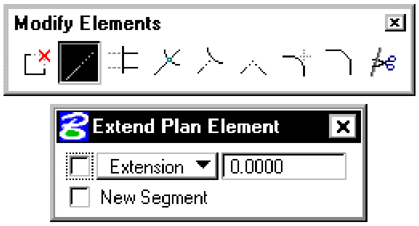
Store Tangent Spiral

The Store Transition Spiral tool quickly places and visually modifies spirals based on an initial line or curve.

4.3 Modify Elements



When a Modify command is selected, a sub pallet will appear to allow the user to enter data if necessary as depicted below.



☐ Extension ▼ 0.0000
☐ New Segment

The **Modify Elements** commands are detailed in the table below.

Partial Delete

The Partial Delete tool enables the user to delete part of a COGO line or curve, creating two separate elements.

Extend Plan View Element

The Extend Plan View Element tool can extend or shorten any COGO element.

Trim Elements

The Trim Elements tool trims numerous elements to their intersection with another element.

Intersect Elements

The Compute Intersection of Two Element tool stores a new point by trimming or extending one element to its intersection with another element. Note the two elements remain intact.

Extend Element to Intersect

The Lengthen or Shorten an Element tool works functionally the same as its MicroStation counterpart.

Extend Elements to Intersect

The Lengthen or Shorten Both Elements tool works functionally the same as its MicroStation counterpart.

Construct Circular Fillet

The Construct a Fillet Between Two Elements tool works functionally the same as its MicroStation counterpart and stores a circular curve between two elements.

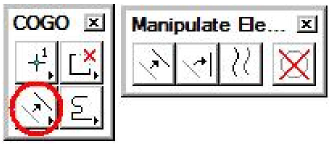
Construct Chamfer

The Construct a Chamfer Between Two Elements tool works functionally the same as its MicroStation counterpart and stores a line between two elements. Both the line and two new endpoints are stored in coordinate geometry.

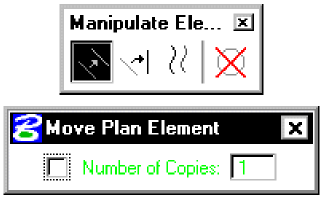
Cut Element

The Cut Elements into Smaller Elements tool cuts elements into segments.

4.4 Manipulate Elements



When a Manipulate command is selected, a sub pallet will appear to allow the user to enter data if necessary as depicted below.



☐ Number of Copies: 1

The Manipulate Elements commands are detailed in the table below.

Move Plan View Element

The Move a Plan View Element enables the user to move an element or to make copies.

Rotate Plan View Element

The Rotate Plan View Element rotates the selected element about a user-defined point. The Angle may be manually entered and locked, or dynamically changing.

Copy Parallel

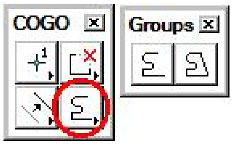
The Copy Parallel tool works functionally the same as its MicroStation counterpart.

Delete Element

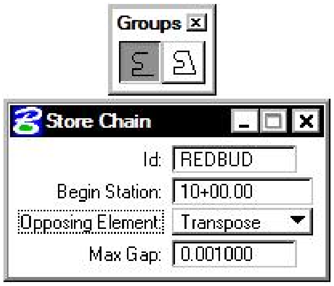
When using the Delete Element tool, no tool settings dialog box opens.

Select and accept the element to be deleted. The element is removed from the coordinate geometry database. This tool works with a MicroStation selection set if present. Warning: there is no undo for this command.

4.5 Groups



When a Group command is selected, the Tool Settings opens to allow the user to enter data if necessary as depicted below.



Store Chain

Id: REDBUD
Begin Station: 10+00.00
Opposing Element: Transpose
Max Gap: 0.001000

The **Groups** Commands are detailed in the table below.

Store Chain

The Store Chain command works in the same manner as the MicroStation Automatic Create Complex Chain with the additional benefit that the chain is automatically stored in the COGO database.

Store Parcel

The Store Parcel tool enables the user to store parcels, takings, easements, and other types of right of way features. It is very similar to the Store Chain tool with many of the same options.

LAB 4: Store a Chain with Graphical COGO

4.1 Create Chain REDBUD Using Graphical COGO

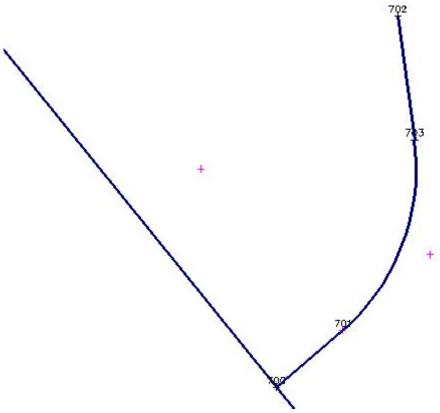
Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB4.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682des.dgn.**

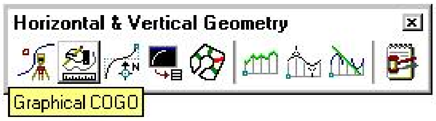
Access the Saved View (**Utilities > Saved Views**) named "**REDBUD**".

Access **Project Manager**. It should automatically access the Road workflow dialog box since we "remembered" the options in Exercise 2.

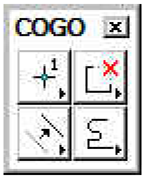
In the following steps, we're going to store a chain (**REDBUD**) that will look similar to the following:



Step 3. Access **Graphical COGO** from the Road Tool Palette using the icon shown below

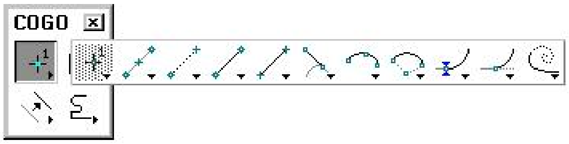


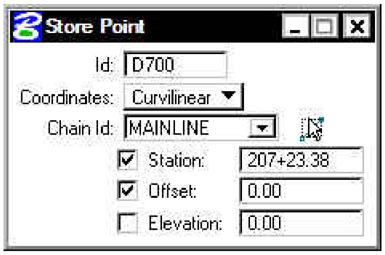
or you can access it using the **Applications > Road > Geometry > Graphical Coordinate** Geometry pulldown. The tool frame depicted below will activate.



Step 4. Ensure that **Permanent Visualization** is set on the COGO dialog box and then sink it.

Step 5. Access the **Store Point** tool in Graphical COGO and fill out the dialog box as shown:

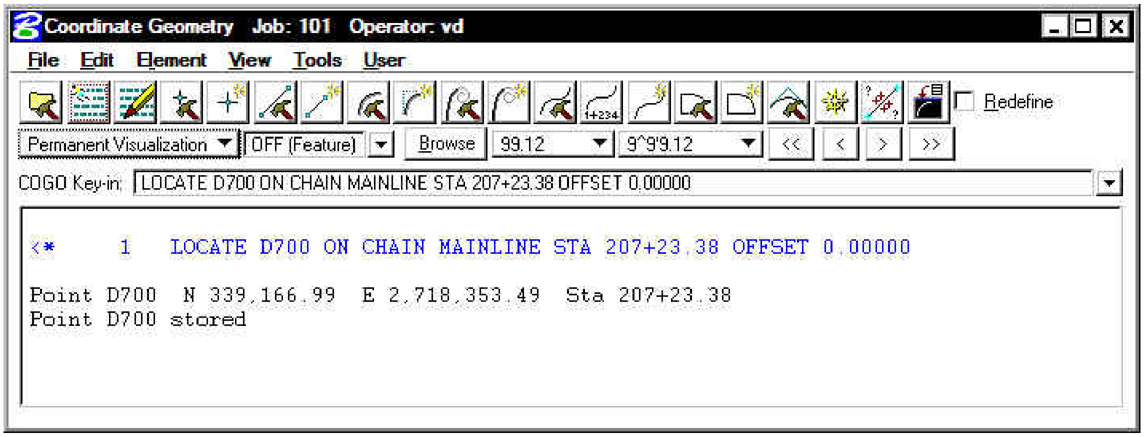



Store Point

Id: D700
Coordinates: Curvilinear
Chain Id: MAINLINE
☑ Station: 207+23.38
☑ Offset: 0.00
☐ Elevation: 0.00

After filling out the dialog box, you'll notice the point is visualized (represented by a circle) in the dgn file. Issue a **DP** anywhere in the dgn file to accept the location of the point.

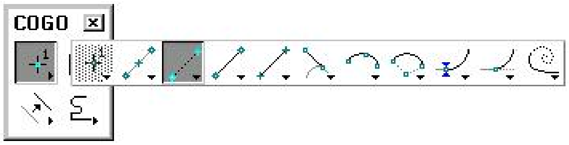
Step 6. Access the COGO Window and review the output. Notice that point **D700** was stored into COGO.


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Redefine
Browse
<<
<
>
>>

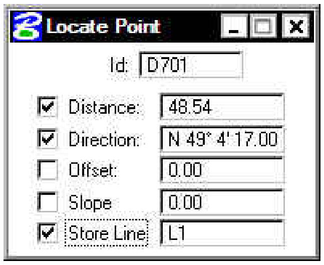
☐ Redefine
Permanent Visualization
OFF (Feature)
99.12
9^9'9.12
COGO Key-in: LOCATE D700 ON CHAIN MAINLINE STA 207+23.38 OFFSET 0.00000

```
<*     1   LOCATE D700 ON CHAIN MAINLINE STA 207+23.38 OFFSET 0.00000

Point D700  N 339,166.99  E 2,718,353.49  Sta 207+23.38
Point D700 stored
```

Step 7. Next, access the **Locate Point** dialog box and fill out as shown:



Note: The directional bearing is **N 49 04 17.00 E**.

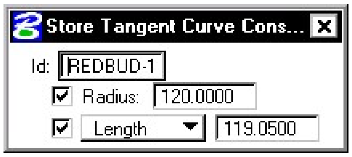

Locate Point

Id: D701
☑ Distance: 48.54
☑ Direction: N 49° 4' 17.00
☐ Offset: 0.00
☐ Slope 0.00
☑ Store Line: L1

With your cursor, **ID** point **D700** that was visualized in Step 5. Issue a second **DP** anywhere in the dgn file to validate the location of point **D701**. Point **D700** and Line **L1** will be visualized in the design file and stored into COGO.

NOTE: The correct location for our project is to the **northeast** of the chain Mainline.

Step 8. Access the **Store Tangent Curve Constrained** dialog box and fill out as shown:


Store Tangent Curve Cons...

Id: REDBUD-1

☑ Radius: 120.0000

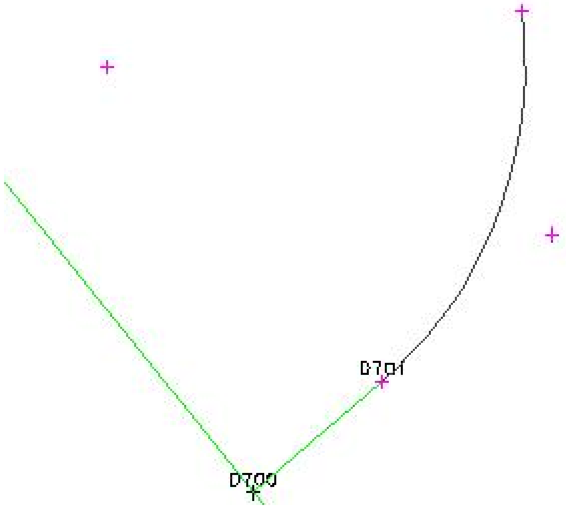
☑ Length 119.0500

With your cursor, **ID** the line that was visualized in the previous step.

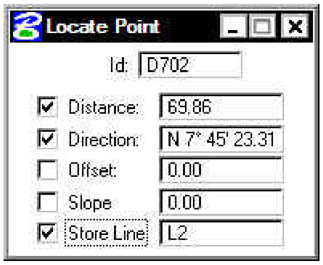
Issue a second **DP** to accept the line.

Issue a third **DP** to identify the direction of the curve.

Issue a fourth **DP** to validate the solution and store the curve.



Step 9. Access the **Locate Point** dialog box once again and fill out as shown:


Locate Point

Id: D702

☑ Distance: 69.86

☑ Direction: N 7° 45' 23.31

☐ Offset: 0.00

☐ Slope 0.00

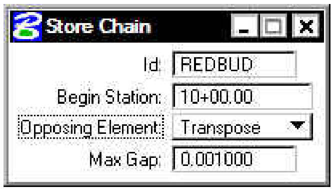
☑ Store Line L2

Note: The directional bearing is **N 7 45 23.31 W**.

With your cursor, **ID** the visualized PT point of the curve.

Issue a second **DP** to validate the solution and store the point.

Step 10. Access the **Store Chain** dialog box and fill out as shown:



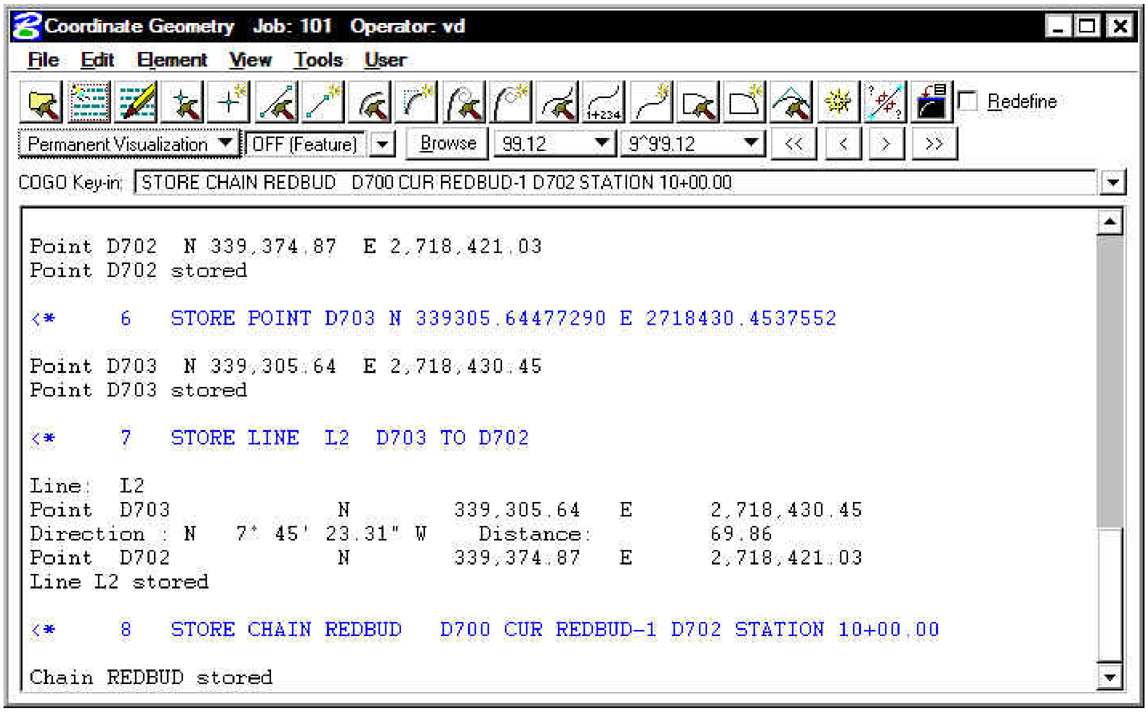
Id: REDBUD
Begin Station: 10+00.00
Opposing Element: Transpose
Max Gap: 0.001000

With your cursor, **ID** the visualized line running between points **D700** and **D701**.

Issue a second **DP** to accept the line.

Issue a third **DP** to accept the direction of the chain and store it into COGO.

Step 11. Dismiss the **Graphical COGO** dialog box. Review the output in COGO and notice the chain **REDBUD** has been stored into COGO.



Permanent Visualization
OFF (Feature)
99.12
9^9.12

COGO Key-in: STORE CHAIN REDBUD D700 CUR REDBUD-1 D702 STATION 10+00.00

```
Point D702  N 339,374.87  E 2,718,421.03
Point D702 stored

<*     6   STORE POINT D703 N 339305.64477290 E 2718430.4537552

Point D703  N 339,305.64  E 2,718,430.45
Point D703 stored

<*     7   STORE LINE  L2  D703 TO D702

Line:  L2
Point  D703             N        339,305.64    E      2,718,430.45
Direction : N   7° 45' 23.31" W    Distance:          69.86
Point  D702             N        339,374.87    E      2,718,421.03
Line L2 stored

<*     8   STORE CHAIN REDBUD   D700 CUR REDBUD-1 D702 STATION 10+00.00

Chain REDBUD stored
```

4.2 Describe Chain

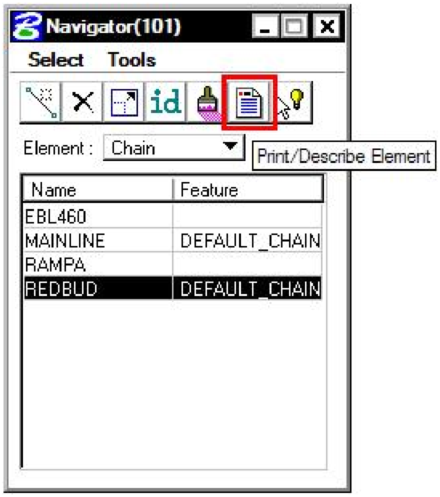
From the COGO dialog window, let's preview the geometry of the chain we just stored.

Step 1. Select the COGO **Navigator** icon

or use the **Tools > Navigator** option on the COGO menu bar to access the COGO Navigator dialog box.

Step 2. Set the element option to **Chain** and highlight the chain **REDBUD.**

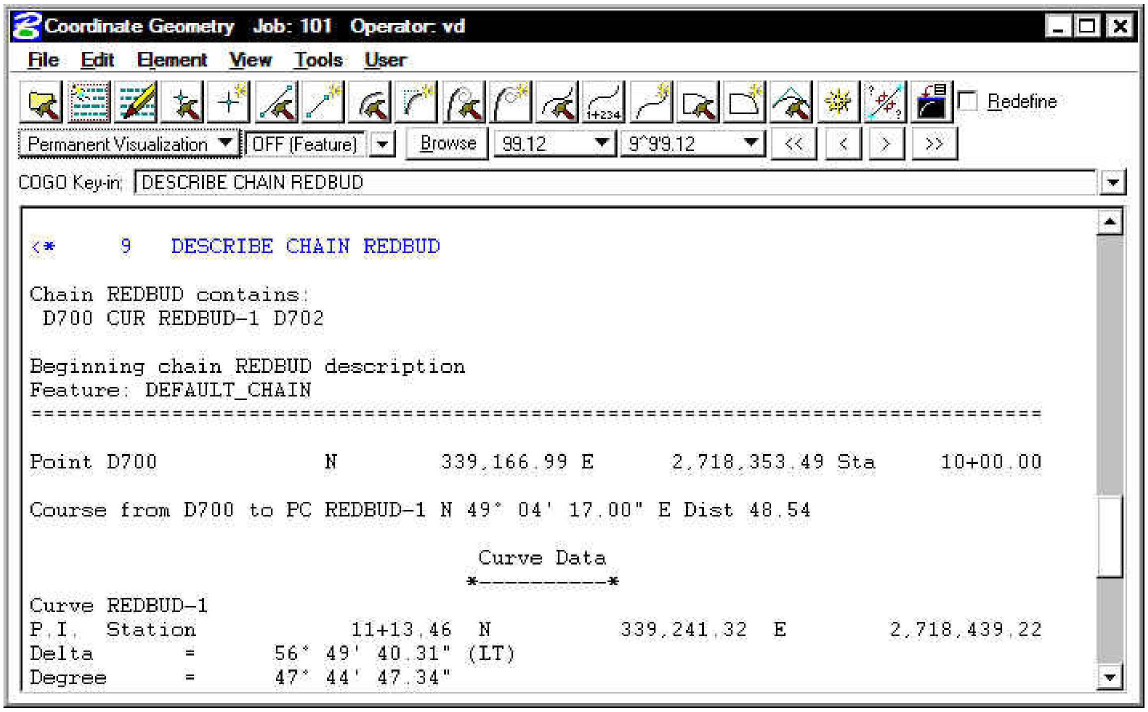
Step 3. Press the "**Print/Describe Element**" icon.


Navigator(101)
Select
Tools
Print/Describe Element

Element : Chain

Name	Feature
EBL460	
MAINLINE	DEFAULT_CHAIN
RAMPA	
REDBUD	DEFAULT_CHAIN

Step 4. The chain geometry output will be displayed in the main COGO window.


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Redefine
Browse
<<
<
>
>>

Permanent Visualization | OFF (Feature) | 99.12 | 9^9.12

COGO Key-in: DESCRIBE CHAIN REDBUD

```
<*     9   DESCRIBE CHAIN REDBUD

Chain REDBUD contains:
 D700 CUR REDBUD-1 D702

Beginning chain REDBUD description
Feature: DEFAULT_CHAIN
===============================================================================

Point D700             N        339,166.99 E      2,718,353.49 Sta     10+00.00

Course from D700 to PC REDBUD-1 N 49° 04' 17.00" E Dist 48.54

                                  Curve Data
                                 *----------*

Curve REDBUD-1
P.I.  Station           11+13.46  N          339,241.32  E        2,718,439.22
Delta        =      56° 49' 40.31" (LT)
Degree       =      47° 44' 47.34"
```

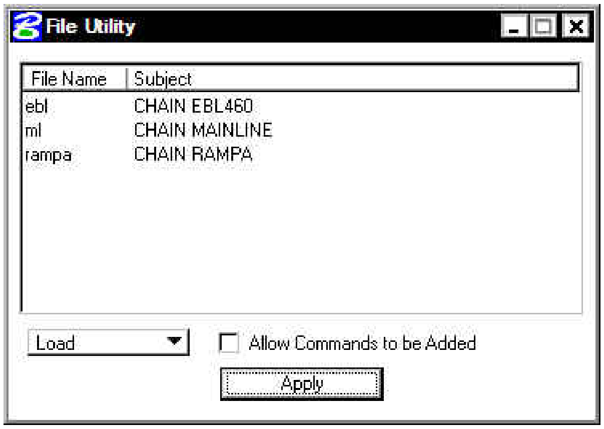
Step 5. Dismiss the **COGO Navigator** dialog box by clicking the "**X**" in the upper right hand corner.

4.3 Create Input and Output Files

In the following steps we will save an input trail of our commands and an output file with the computations of chain **REDBUB**.

Step 1. Access the **File Utility** dialog by pressing the **File Utility** icon

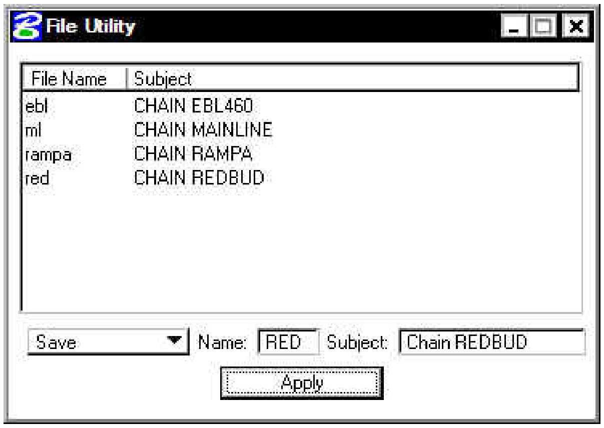
or by selecting **File > File Utility**. The dialog box below should appear.



File Name	Subject
ebl	CHAIN EBL460
ml	CHAIN MAINLINE
rampa	CHAIN RAMPA

☐ Allow Commands to be Added

Step 2. On the **File Utility** dialog box, set the option button to **Save**.

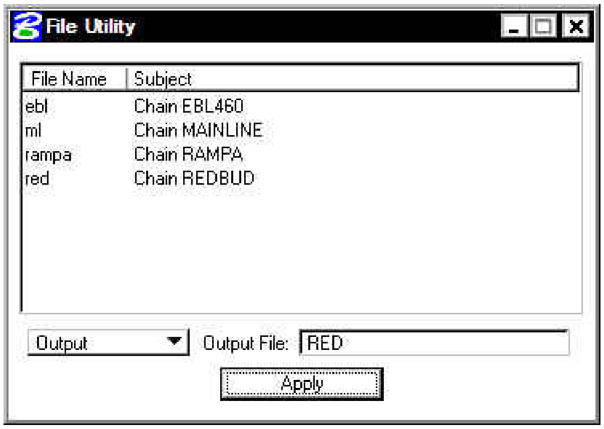


File Name	Subject
ebl	CHAIN EBL460
ml	CHAIN MAINLINE
rampa	CHAIN RAMPA
red	CHAIN REDBUD

Save
Name: RED
Subject: Chain REDBUD

Step 3. Enter “**RED**” for the **Name** and **“Chain REDBUD”** for the **Subject** then click **Apply**. The saved file will be called ‘**RED101.ivd**’

Step 4. To save an output file with the actual results of the computations, set the option button to **Output** on the **File Utility** dialog.


File Utility
Apply

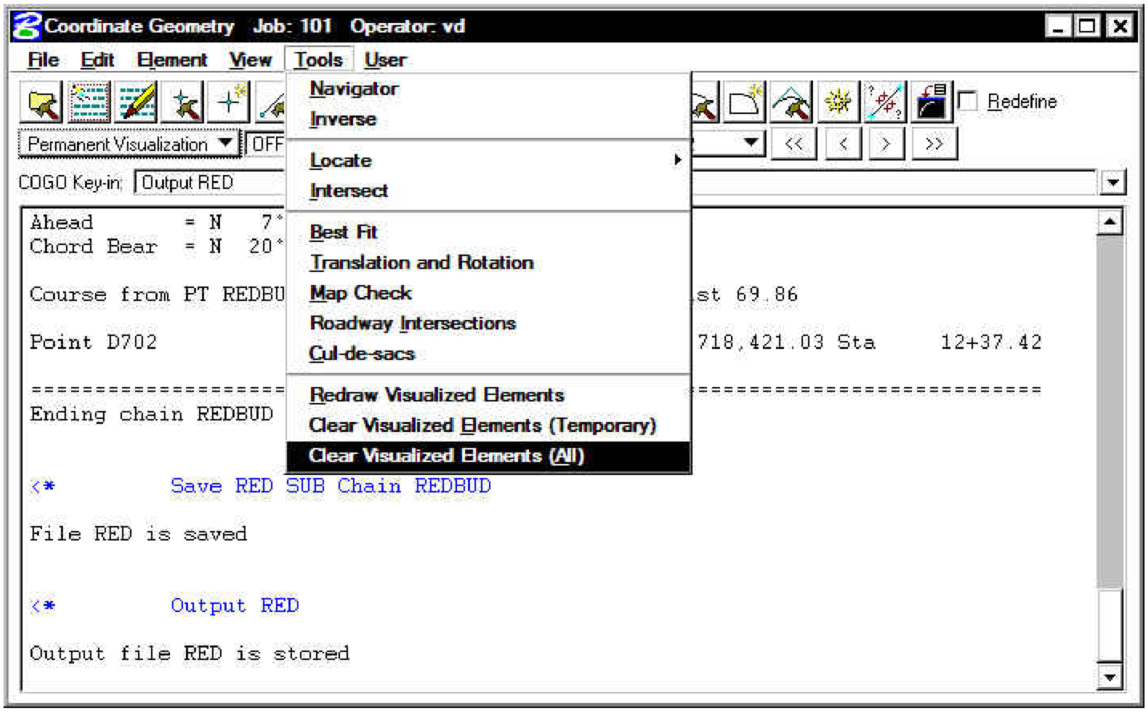
File Name	Subject
ebl	Chain EBL460
ml	Chain MAINLINE
rampa	Chain RAMPA
red	Chain REDBUD

Output
Output File: RED

Step 5. **Output File** should be set to "**RED**". Click **Apply**. The saved file will be called **'RED101.ovd'**.

Step 6. Dismiss the **File Utility** dialog box by clicking the "**X**" in the upper right hand corner.

Step 7. Clear all the visualized elements from the file using the **Tools > Clear Visualized Elements (ALL)** pulldown.


Coordinate Geometry Job: 101 Operator: vd
File
Edit
Element
View
Tools
User
Navigator
Inverse
Locate
Intersect
Best Fit
Translation and Rotation
Map Check
Roadway Intersections
Cul-de-sacs
Redraw Visualized Elements
Clear Visualized Elements (Temporary)
Clear Visualized Elements (All)
Redefine
Permanent Visualization
OFF

COGO Key-in: Output RED

```
Ahead        = N   7°
Chord Bear   = N  20°

Course from PT REDBU                        st 69.86

Point D702                                  718,421.03 Sta     12+37.42

====================                        ===========================
Ending chain REDBUD


<*          Save RED SUB Chain REDBUD

File RED is saved


<*          Output RED

Output file RED is stored
```

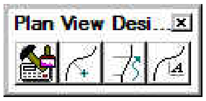
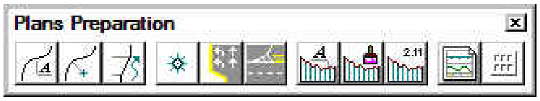
Step 8. Dismiss the **COGO** dialog box by clicking the "**X**" in the upper right hand corner.

Step 9. Exit MicroStation.

CHAPTER 5

Design and Computation Manager

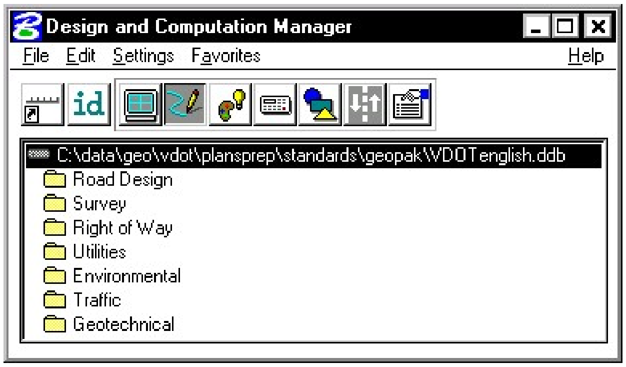
5.1 Introduction

Objectives	Understand the use of the **D&C Manager** to plot horizontal alignments into MicroStation. Understand the format of the hierarchical database and how to use it. Be able to use the D&C Manager in conjunction with other GEOPAK tools & MicroStation to draw and manipulate elements.
Project Manager	Plan View Design
Road Tool Frame	 
Menu Bar Application	GEOPAK Road > Design and Computation Manager GEOPAK Road > Plans Preparation > DP Station Offset GEPAK Road > Plans Preparation > Draw Transition

The **Design and Computation Manager** (D&C Manager) is a tool that allows the user to standardize graphics elements for drafting and pay item quantities.

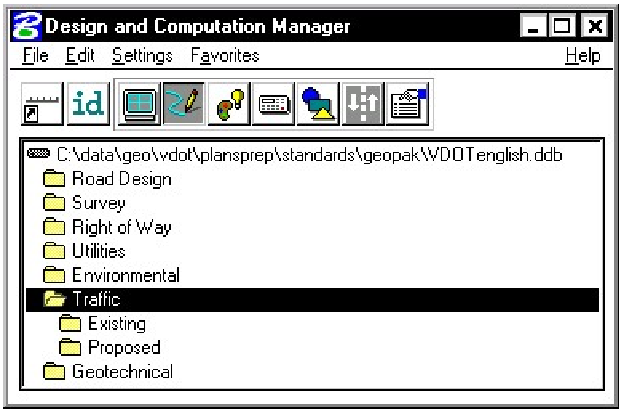
A hierarchical database is used with the **Design and Computation Manager**. This database stores information concerning functional classification and display preferences for each feature and item used in a MicroStation file. This file is commonly referred to as the **ddb** file (*.ddb).

Categories are used to group and classify the features and items used in creating construction drawings. In the example below, **Road Design** and **Right of Way** are both categories. Categories are represented with a folder icon.



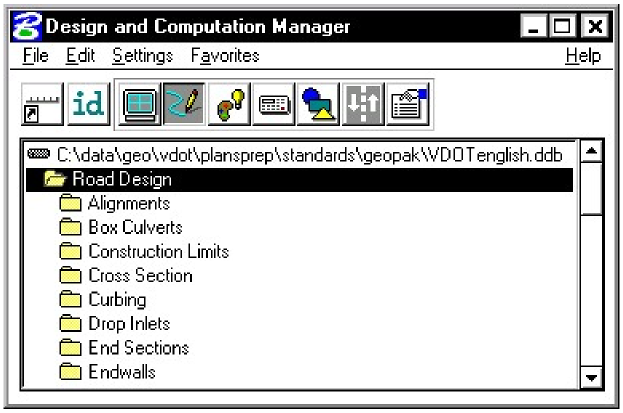
C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
- Geotechnical

These categories each may contain sub-categories. The sub-categories break down each classification into more specific items. For example, **Traffic** may be broken into several additional categories such as **Existing** and **Proposed**.


Design and Computation Manager
File Edit Settings Favorites Help

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
- Geotechnical

Within a category, the items that are included are designated according to the process that they will be used for (as a drafting item indicated by a paintbrush shown in the following diagram):

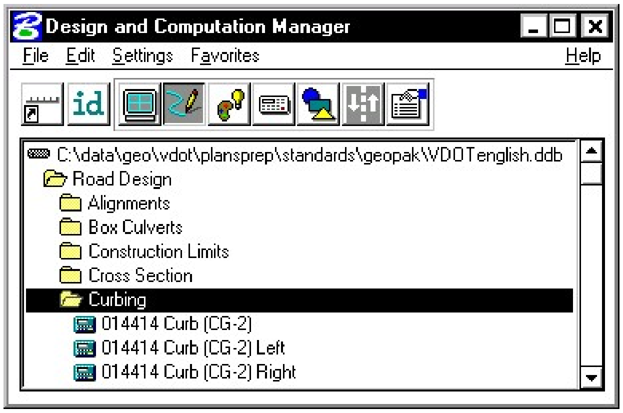

Design and Computation Manager
File Edit Settings Favorites Help

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
  - Alignments
  - Box Culverts
  - Construction Limits
  - Cross Section
  - Curbing
  - Drop Inlets
  - End Sections
  - Endwalls

Each entry represents a specific item. The various icons representing the function they will be utilized for can identify items.

🖌	Paintbrush (draw design elements)
🖩	Calculator (quantities calculations)
🗎	Report icon (default, pavement design, pavement markings, etc.)

See calculator icons in diagram below:

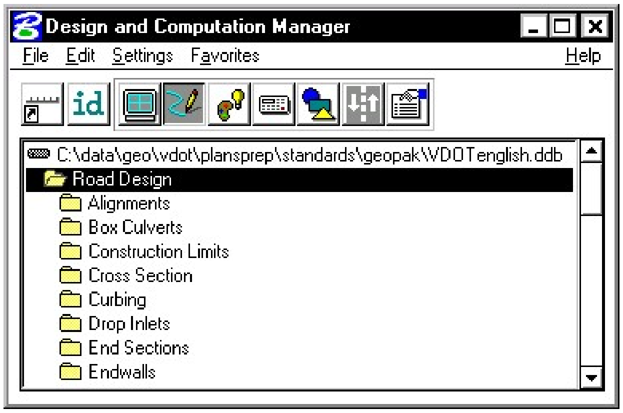

Design and Computation Manager
File Edit Settings Favorites Help

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
Road Design
Alignments
Box Culverts
Construction Limits
Cross Section
Curbing
014414 Curb (CG-2)
014414 Curb (CG-2) Left
014414 Curb (CG-2) Right

The database may also be password protected if desired. This can be used as a security measure to protect the integrity of the database file and ensure its consistent application within an organization.

5.2 Accessing the Design and Computation Manager

When the Design and Computation Manager is accessed, two dialog boxes are displayed.

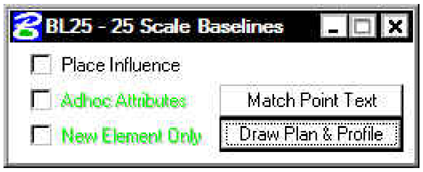

Design and Computation Manager
File Edit Settings Favorites Help

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
Road Design
Alignments
Box Culverts
Construction Limits
Cross Section
Curbing
Drop Inlets
End Sections
Endwalls

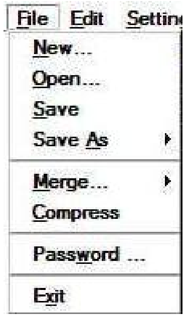
The main D&C Manager dialog box is composed of two distinct areas:

- Across the top are icons for the various modes. The D&C Manager may be configured to operate in seven different modes: **Display, Design, Set, Compute, Shape, Pavement Marking** and **Preferences.** As various modes are selected, more icons are displayed within this area.
- The **Path box** displays the name of the attached database file and your current position within the database structure. It lists the categories, sub-categories and items available for selection. This hierarchical data structure functions much like a directory. Double clicking enables the user to move up or down within the database.

A second dialog box appears differently depending on the mode of operation. This dialog box enables the user to set other options not available on the main dialog box. The dialog box below appears when you click on the Design Icon.


BL25 - 25 Scale Baselines
☐ Place Influence
☐ Adhoc Attributes
☐ New Element Only
Match Point Text
Draw Plan & Profile

5.2.1 File Commands


File
Edit
Settin
New...
Open...
Save
Save As
Merge...
Compress
Password ...
Exit

For the GEOPAK designer, the only file command options needed are **Open** and **Exit**. The other commands such as **Save**, **Merge** and **Compress** are used by personnel who maintain the database.

As mentioned previously, the **Password** option may be used to password protect the database so a user would not be able to make changes to it.

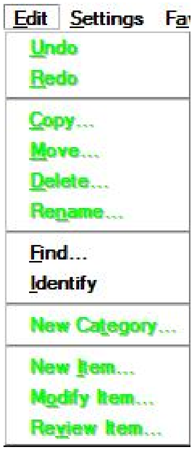
5.2.2 Edit Commands

As a designer, the most-used Edit commands will be Find, Identify and Review Item.

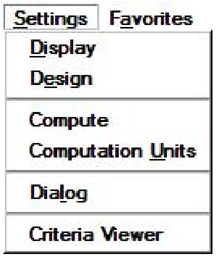
Find – This tool will search the database (from your current location) for an item or category. If the database is password protected, all other items will be disabled.

Identify – This tool will allow you to select an element in the design file to identify which item it matches in the database.

Review Item – This tool will allow you to review the settings/symbology for a particular item in the database.


Edit
Settings
Fa
Undo
Redo
Copy...
Move...
Delete...
Rename...
Find...
Identify
New Category...
New Item...
Modify Item...
Review Item...

5.2.3 Settings


Settings
Favorites
Display
Design
Compute
Computation Units
Dialog
Criteria Viewer

Display Settings - temporarily changes the display of elements on the screen to one common color, then the user may specify additional elements to be viewed in their original colors. This tool enhances visualization when working on a complex project.

Design Settings - sets the *maximum gap* tolerance and *deduction tolerance* used in computations and the drawing scale for placing cells.

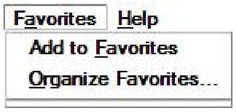
Compute – This dialog box contains fields and options specific to the Compute process.

Computation Units – This dialog box shows the computational units available for the current system - English or Metric.

Dialog – This option controls how the level up and level down icons function when clicked when using D&C Manager in toolbox mode.

Criteria Viewer – This toggle is used when a criteria writer is troubleshooting new 3PC.

5.2.4 Favorites


Favorites
Help
Add to Favorites
Organize Favorites...

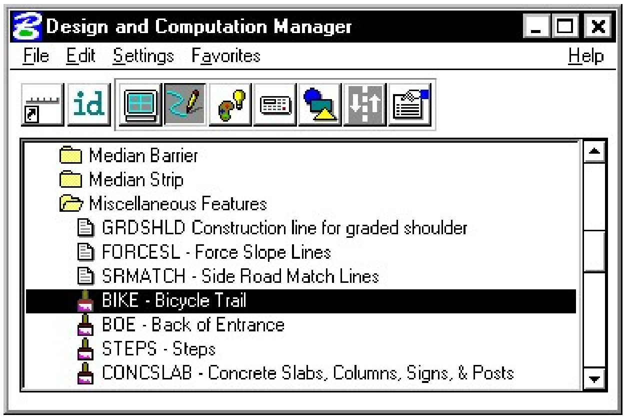
Add to Favorites - saves current D&C Manager path for easy recall in the future.

Organize Favorites – allows the organization of previously saved paths.

5.3 Operational Mode - Design

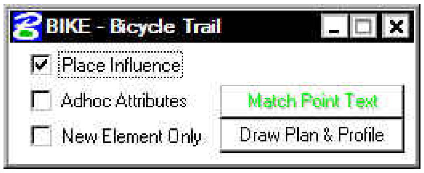
The Design mode enables the user to draw each roadway element or COGO element (and associated attributes) in the design file based on drafting item parameters.

First, the desired item is highlighted in the main dialog list box, i.e., alignment, edge of pavement, etc.


Design and Computation Manager
File
Edit
Settings
Favorites
Help
id

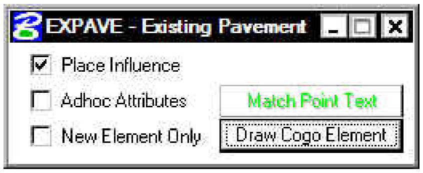
Median Barrier
Median Strip
Miscellaneous Features
GRDSHLD Construction line for graded shoulder
FORCESL - Force Slope Lines
SRMATCH - Side Road Match Lines
BIKE - Bicycle Trail
BOE - Back of Entrance
STEPS - Steps
CONCSLAB - Concrete Slabs, Columns, Signs, & Posts

The **Place Influence** option sets the level, symbology and attribute tags of elements drawn or copied using MicroStation commands. When the **Place Influence** toggle is activated, elements are drawn using the level, symbology and attributes as defined in the GEOPAK database. When **Place Influence** is off, elements are drawn using the active level, symbology and attributes of MicroStation.


BIKE - Bicycle Trail
Match Point Text
Draw Plan & Profile

☑ Place Influence
☐ Adhoc Attributes
☐ New Element Only

The **Draw Cogo Element** button is for drawing COGO elements to a design file. A single click to this button prompts the user for a job number, then opens a dialog box that enables the user to choose a COGO item to draw.

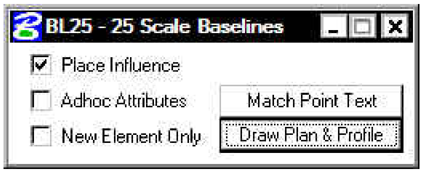

EXPAVE - Existing Pavement

☑ Place Influence

☐ Adhoc Attributes

☐ New Element Only
Match Point Text
Draw Cogo Element

If an alignment, profile or parcel item is chosen, the **Draw Cogo Element** button changes to **Draw Plan and Profile**.

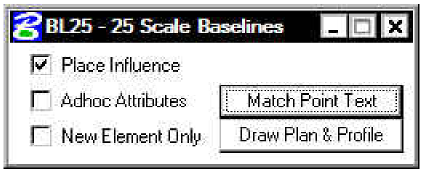

BL25 - 25 Scale Baselines

☑ Place Influence

☐ Adhoc Attributes

☐ New Element Only
Match Point Text
Draw Plan & Profile

If **Match Point Text** is selected the active MicroStation settings are set to match the drafting preferences symbology for points of the selected item.

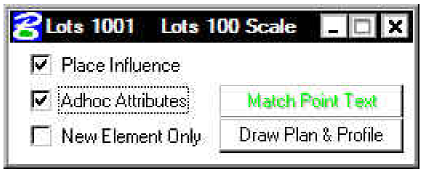

BL25 - 25 Scale Baselines

☑ Place Influence

☐ Adhoc Attributes

☐ New Element Only
Match Point Text
Draw Plan & Profile

Adhoc Attributes is used with **Place Influence** to add Adhoc Attributes to any new element when that element is drawn.

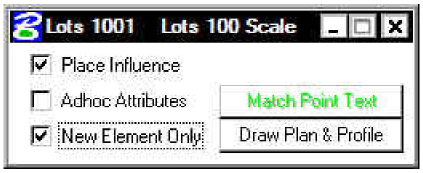

Lots 1001 Lots 100 Scale

☑ Place Influence

☑ Adhoc Attributes

☐ New Element Only
Match Point Text
Draw Plan & Profile

If **New Element Only** is selected and an element is modified or moved, it’s symbology is not changed to the selected item.


Lots 1001 Lots 100 Scale

☑ Place Influence

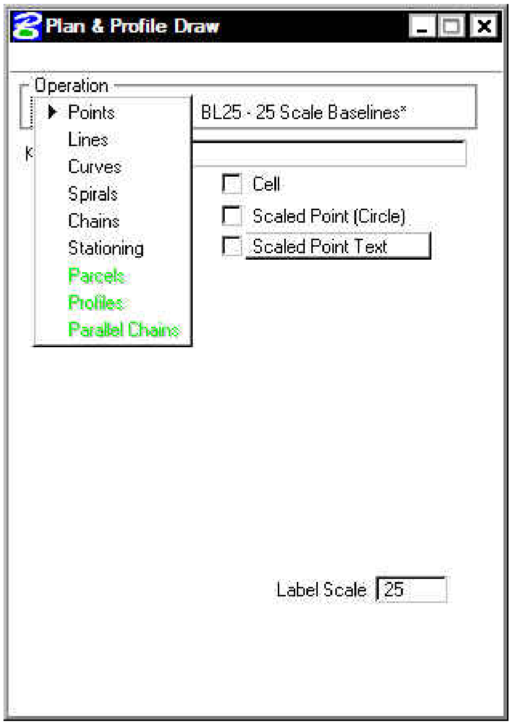
☐ Adhoc Attributes

☑ New Element Only
Match Point Text
Draw Plan & Profile

From the secondary dialog box that is opened, click the **Draw Plan & Profile** button to initiate the drawing of COGO elements into the design file. Clicking this button prompts the user for a job number (the coordinate geometry database file wherein the COGO elements are stored), and then opens a dialog box that enables the user to choose a COGO item to draw. **Do Not** activate the **Place Influence** toggle when using **Draw Plan & Profile**.

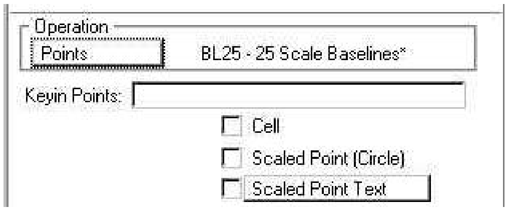
If utilizing the Design & Computation Manager within Project Manager, you are not prompted for a job number since this is associated with the active project.

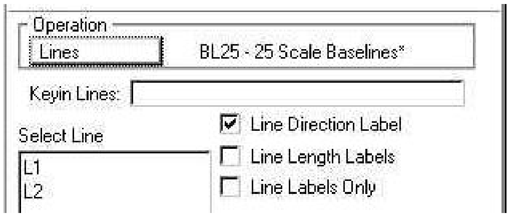
Eight operations may be accessed from the Plan and Profile Draw dialog box: Points, Lines, Curves, Spirals, Chains, Stationing, Parcels, and Profiles. Each of these operations dynamically changes the dialog box to reflect the selection with the various draw and label features used when placing a COGO element in a graphics file.


Plan & Profile Draw
Operation
Points
Lines
Curves
Spirals
Chains
Stationing
Parcels
Profiles
Parallel Chains
BL25 - 25 Scale Baselines*
K
☐ Cell
☐ Scaled Point (Circle)
☐ Scaled Point Text
Label Scale

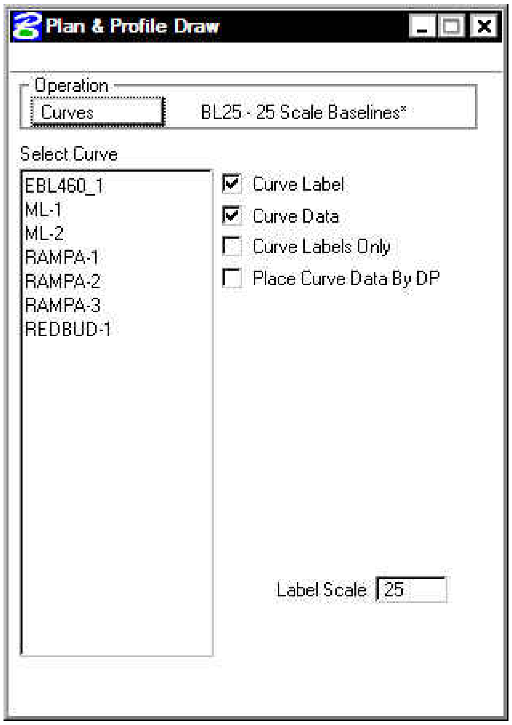
Label Scale: 25

The points and lines dialog boxes have a key-in field that allows the user to specify the names of the COGO elements to be drawn. To use the line operation, the user must use point numbers to specify the ends of the line. The points/lines are drawn immediately after you enter their respective names and press the enter key. To draw more than one point or line, place a dash in-between the point numbers. To draw a line without using consecutive point numbers, use a forward slash (i.e. 10/11).


Operation
Points
BL25 - 25 Scale Baselines*
Keyin Points:
☐ Cell
☐ Scaled Point (Circle)
☐ Scaled Point Text


Operation
Lines
BL25 - 25 Scale Baselines*
Keyin Lines:
Select Line
L1
L2
☑ Line Direction Label
☐ Line Length Labels
☐ Line Labels Only

The dialog box settings for curves, spirals, chains, stationing, parcels, and profiles have a list box that display the names of all curves, spirals and chains stored in the active coordinate geometry database file. Highlighting one of the available elements initiates further commands to draw the element into the design file. Each type of item has a list of parameters that can be optionally plotted.



Curves   BL25 - 25 Scale Baselines*

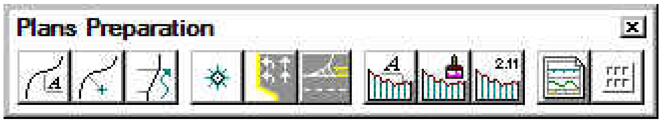
EBL460_1
ML-1
ML-2
RAMPA-1
RAMPA-2
RAMPA-3
REDBUD-1

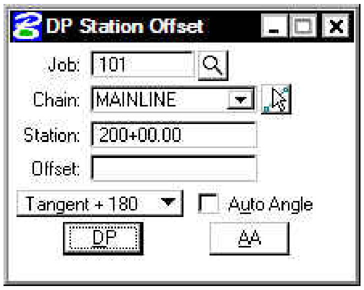
☑ Curve Label
☑ Curve Data
☐ Curve Labels Only
☐ Place Curve Data By DP

Label Scale 25

GEOPAK can draw elements to non-active levels. After elements are drawn, it may be necessary to turn on appropriate levels and use the MicroStation fit command to view the elements.

5.4 DP Station/Offset

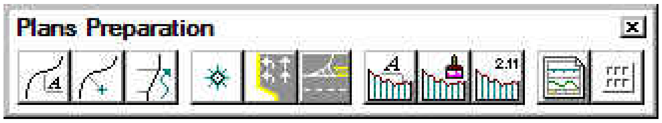
Feature / Function	Utilize any station / offset in MicroStation commands requiring a data point.
Tools	
Menu Bar Application	GEOPAK Road > Plans Preparation > DP Station Offset



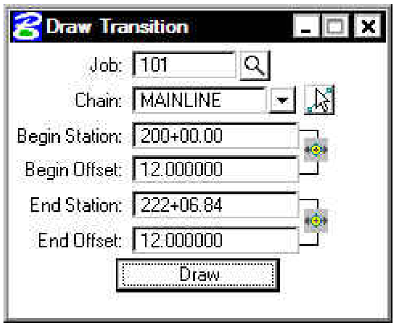
Job: 101
Chain: MAINLINE
Station: 200+00.00
Offset:
Tangent + 180
☐ Auto Angle

The **DP Station/Offset** command works in conjunction with MicroStation commands and the D&C Manager. It can be used as the *data point* for any MicroStation command. **DP Station/Offset** provides precision placement of elements based on a station and offset of a stored chain. Uses for this command include precision placement of elements and window functions.

5.5 Draw Transition

Feature / Function	Draw transition based on a two sets of station / offsets.
Tools	
Menu Bar Application	GEOPAK Road > Plans Preparation > Draw Transition

The **Draw Transition** tool draws a line/curve based on a beginning station/offset and an ending station/offset relative to a selected chain. Use of this command includes turn lanes, mailbox widening, curve widening and lane transitions.



Job: 101
Chain: MAINLINE
Begin Station: 200+00.00
Begin Offset: 12.000000
End Station: 222+06.84
End Offset: 12.000000

Elements placed with **Draw Transition** have MicroStation element type **curve** when the beginning and ending offsets are different and MicroStation element type **line** and/or **arc** when the beginning and ending offsets are the same.

LAB 5: D&C Manager – Plans Production

5.1 Accessing Design and Computation Manager

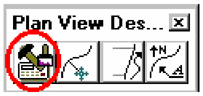
5.1.1 Right Of Way

Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB5.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682des.dgn**

Step 3. Access **Project Manager**. It should automatically access the Road workflow dialog box since we “remembered” the options in Exercise 2.

Step 4. Select the icon **Plan View Design** button from the **Road Project: 17682.prj** workflow dialog box, which opens the Plan View Design tool box.


Plan View Des...

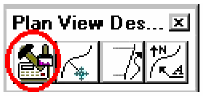
5.1.2 Traffic

Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB5.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682Traffic.dgn**

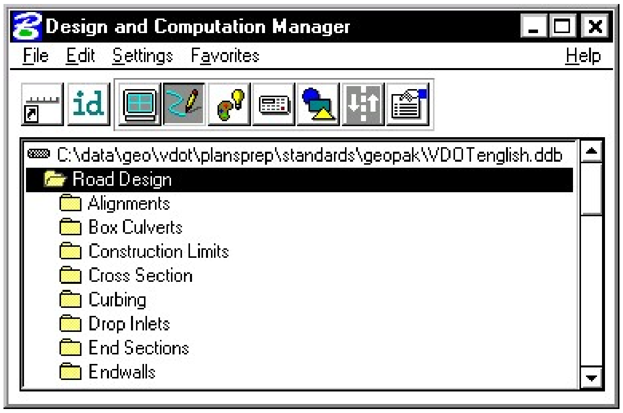
Step 3. Access **Project Manager**. It should automatically access the Road workflow dialog box since we “remembered” the options in Exercise 2.

Step 4. Select the icon **Plan View Design** button from the **Road Project: 17682.prj** workflow dialog box, which opens the Plan View Design tool box.

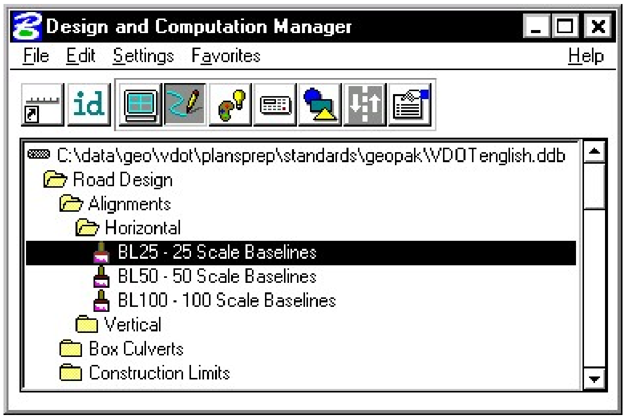

Plan View Des...

5.2 Drawing Alignments

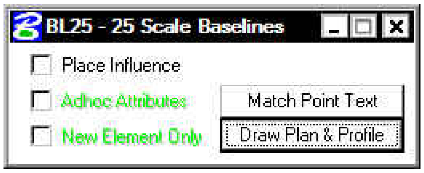
Step 1. Select the Design and Computation Manager icon (as indicated above) to invoke the Design and Computation Manager shown below. A secondary dialog box will appear to be used in conjunction with the Design and Computation Manager dialog box.


Design and Computation Manager
File Edit Settings Favorites Help
C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
Road Design
Alignments
Box Culverts
Construction Limits
Cross Section
Curbing
Drop Inlets
End Sections
Endwalls

Step 2. Select the item shown in the dialog box below.


Design and Computation Manager
File
Edit
Settings
Favorites
Help
C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
Road Design
Alignments
Horizontal
BL25 - 25 Scale Baselines
BL50 - 50 Scale Baselines
BL100 - 100 Scale Baselines
Vertical
Box Culverts
Construction Limits

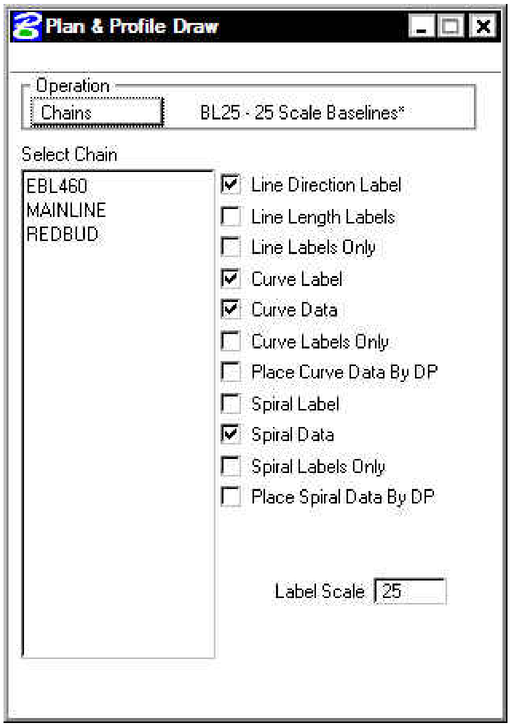
Step 3. Next, select the **Draw Plan and Profile** button from the secondary dialog box:


BL25 - 25 Scale Baselines
Match Point Text
Draw Plan & Profile

☐ Place Influence
☐ Adhoc Attributes
☐ New Element Only

Step 4. Select the **Chains** operation. Each of the chains will be displayed in the list box as shown. Notice that the options that are to be drawn with the chain are already activated. Set the Label Scale to **25**.

Step 5. To draw the chains, click each name in the list box. Only click once!! Each time you ID a chain it will be plotted into the design file.


Plan & Profile Draw
Operation
Chains
BL25 - 25 Scale Baselines*
Select Chain
EBL460
MAINLINE
REDBUD

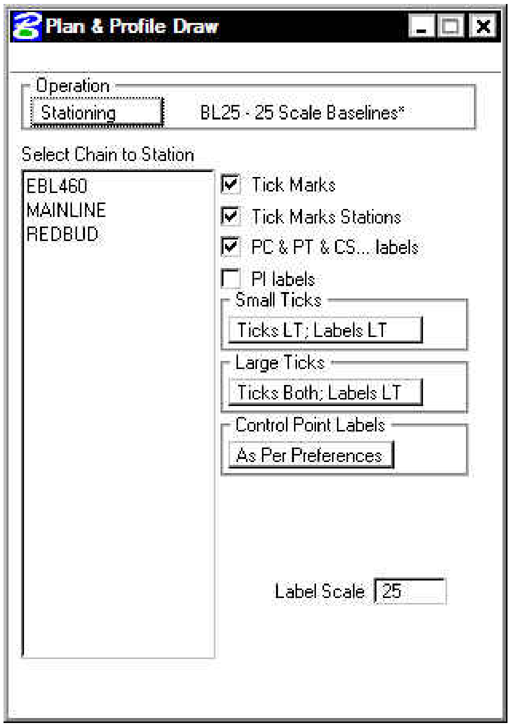
☑ Line Direction Label
☐ Line Length Labels
☐ Line Labels Only
☑ Curve Label
☑ Curve Data
☐ Curve Labels Only
☐ Place Curve Data By DP
☐ Spiral Label
☑ Spiral Data
☐ Spiral Labels Only
☐ Place Spiral Data By DP

Label Scale 25

Step 6. Change the Operation to **Stationing** and modify the dialog settings as shown in the image to the right.

Annotate each alignment by clicking the chain names in the list box.

Step 7. Review the results of Steps five and six.



Plan & Profile Draw

Operation: Stationing — BL25 - 25 Scale Baselines*

Select Chain to Station:
- EBL460
- MAINLINE
- REDBUD

☑ Tick Marks
☑ Tick Marks Stations
☑ PC & PT & CS... labels
☐ PI labels

Small Ticks: Ticks LT; Labels LT

Large Ticks: Ticks Both; Labels LT

Control Point Labels: As Per Preferences

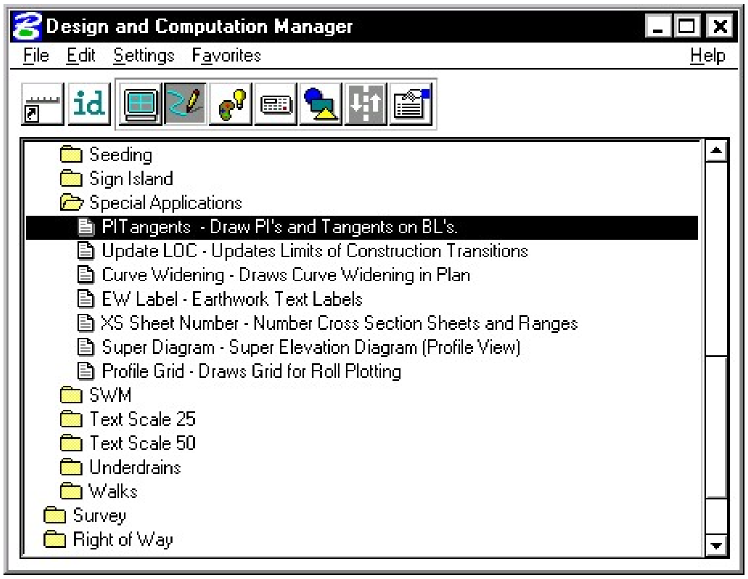
Label Scale: 25

Step 8. Exit the **Plan and Profile Draw** dialog box but remain in D&C Manager.

5.2.1 Use Special Application to Label PI's and Tangent Lines

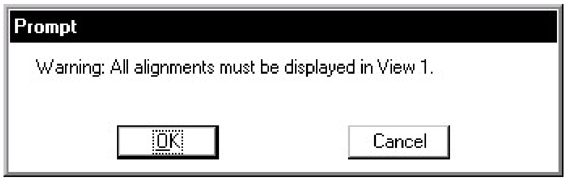
Step 1. Do a Fit View to ensure that all alignments are displayed in the view.

Step 2. Select the **Design** mode then navigate to **Road Design > Special Applications > PITangents - Draw PI's and Tangents on BL's.**


Design and Computation Manager
File Edit Settings Favorites Help
Seeding
Sign Island
Special Applications
PITangents - Draw PI's and Tangents on BL's.
Update LOC - Updates Limits of Construction Transitions
Curve Widening - Draws Curve Widening in Plan
EW Label - Earthwork Text Labels
XS Sheet Number - Number Cross Section Sheets and Ranges
Super Diagram - Super Elevation Diagram (Profile View)
Profile Grid - Draws Grid for Roll Plotting
SWM
Text Scale 25
Text Scale 50
Underdrains
Walks
Survey
Right of Way

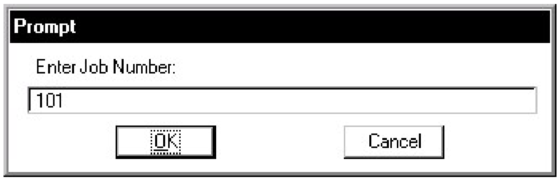
Step 3. **Double-Click** on the item to kick off the application.

Step 4. Ensure that all alignments are displayed in the view then click **OK** on the dialog box below.


Prompt
OK
Cancel

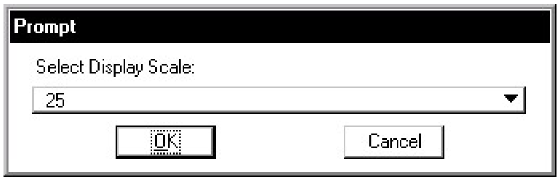
Warning: All alignments must be displayed in View 1.

Step 5. Populate the dialog box as below then click **OK**.


Prompt
OK
Cancel

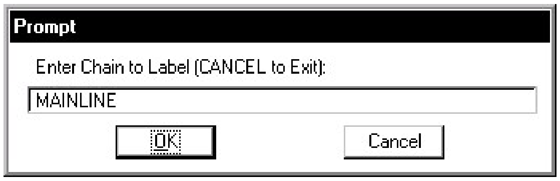
Enter Job Number: 101

Step 6. Populate the dialog box as below then click **OK**.


Prompt
OK
Cancel

Select Display Scale: 25

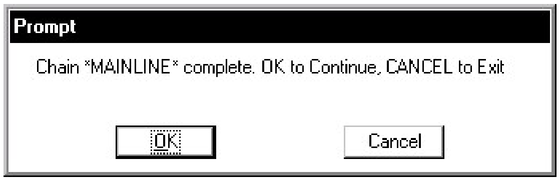
Step 7. Populate the dialog box as below then click **OK**.


Prompt
OK
Cancel

Enter Chain to Label (CANCEL to Exit):

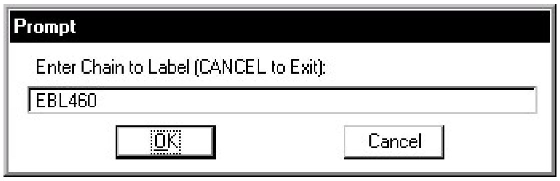
MAINLINE

Step 8. When the dialog box below appears, click **OK**.


Prompt
OK
Cancel

Chain *MAINLINE* complete. OK to Continue, CANCEL to Exit

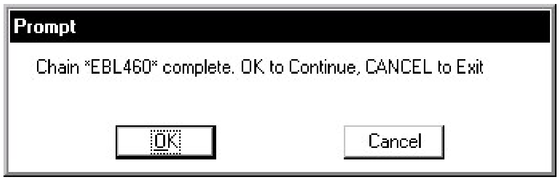
Step 9. Populate the dialog box as below then click **OK**.


Prompt
OK
Cancel

Enter Chain to Label (CANCEL to Exit):

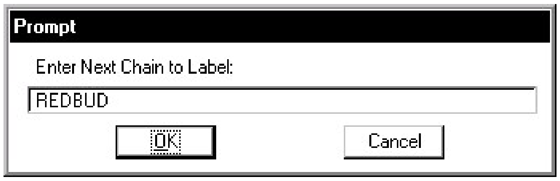
EBL460

Step 10. When the dialog box below appears, click **OK**.


Prompt
OK
Cancel

Chain *EBL460* complete. OK to Continue, CANCEL to Exit

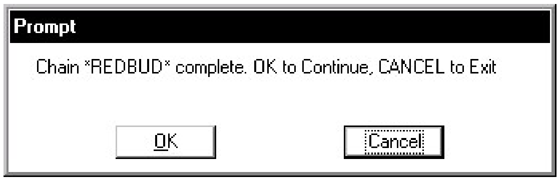
Step 11. Populate the dialog box as below then click **OK**.


Prompt
OK
Cancel

Enter Next Chain to Label:

REDBUD

Step 12. When the dialog box below appears, click **Cancel**.


Prompt
OK
Cancel

Chain *REDBUD* complete. OK to Continue, CANCEL to Exit

Step 13. Review the PI Labels and Tangent Lines that were placed.

5.3A Drawing Right Of Way Features

We are going to develop roadway features representing the proposed roadway. The roadway is made up of 4 distinct sections:

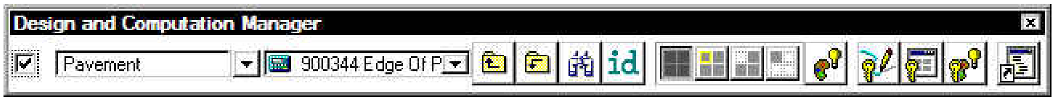
- 4 lane divided highway with depressed median from **Sta. 200+00** to **Sta. 202+00**. Left side of the roadway will be resurfacing while the right side is new construction.
- 4 lane divided highway with raised median from **Sta. 202+00** to **Sta. 204+25**. Left side of the roadway will be resurfacing while the right side is new construction.
- 4 lane undivided highway from **Sta**. **204+25** to **Sta**. **211+00**.
- 2 Lane highway with Entrances and Exit Ramps from **Sta. 211+00** to **Sta. 220+00.**

To perform these tasks, two specific GEOPAK tools will be utilized: **D&C Manager** to determine element symbology and **Draw Transition** to place the elements between specific pairs of stations and offsets. Because of time constraints, we will not develop the planametrics for the entire project, but just for a select area.

Step 1. Navigate to the item **Road Design > Pavement > 900344 Edge of Pavement**.

Step 2. Select the item **900344 Edge of Pavement** and then enable **Place Influence**.

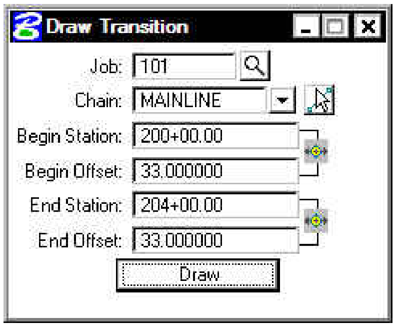
Step 3. If desired, click on the **Switch to Toolbox Mode** (left most icon) icon on D&C Manager.



Design and Computation Manager

☑ Pavement | 900344 Edge Of P

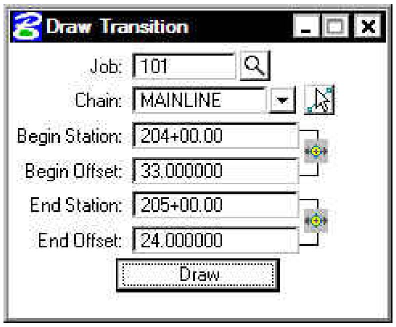
Step 4. Open the Draw Transition tool from the **Plan View Design** palette. Fill in the values as shown below then click **Draw**. This will draw the right edge of pavement between the given station range.



Draw Transition

Job: 101
Chain: MAINLINE
Begin Station: 200+00.00
Begin Offset: 33.000000
End Station: 204+00.00
End Offset: 33.000000

Step 5. Next, modify the dialog box as shown to draw the edge of pavement transitioning from **204+00 to 205+00**.



Draw Transition

Job: 101
Chain: MAINLINE
Begin Station: 204+00.00
Begin Offset: 33.000000
End Station: 205+00.00
End Offset: 24.000000

Step 6. Draw the additional **Pavement** features shown in the following table. Check that the correct feature is selected in D&C Manager before continuing.

Note: All items shown in the table fall under the category **Road Design.**

Feature	Beg. Station	Beg. Offset	End Station	End Offset
Pavement > 900344 Edge of Pavement	200+00	-33.0	204+00	-33.0
Pavement > 900344 Edge of Pavement	204+00	-33.0	205+00	-24.0
Pavement > 900344 Edge of Pavement	205+00	24.0	211+00	24.0
Pavement > 900344 Edge of Pavement	205+00	-24.0	211+00	-24.0
Pavement > 900344 Edge of Pavement	211+00	24.0	212+00	12.0
Pavement > 900344 Edge of Pavement	211+00	-24.0	212+00	-12.0
Pavement > 900344 Edge of Pavement	212+00	12.0	216+00	12.0
Pavement > 900344 Edge of Pavement	212+00	-12.0	216+00	-12.0

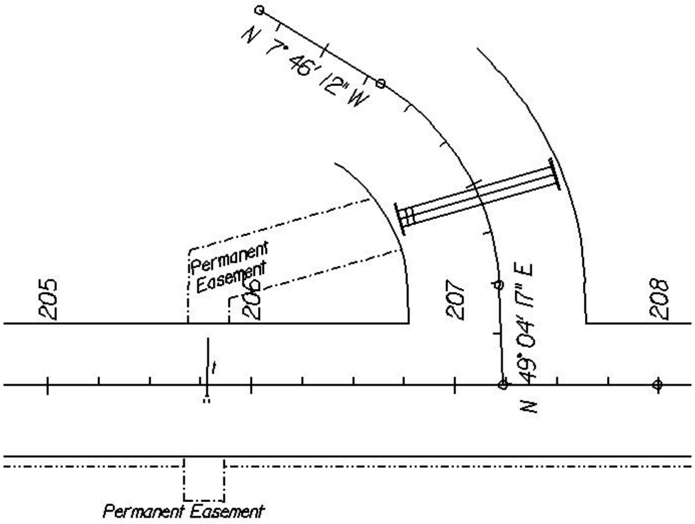
Step 7. Draw the additional **Right Of Way** features shown in the following table. Check that the correct feature is selected in D&C Manager before continuing.

Note: All items shown in the table fall under the category **Right Of Way.**

Feature	Chain	Beg. Station	Beg. Offset	End Station	End Offset
Right of Way > ROW Right of Way Lines	MAINLINE	200+00	40.0	213+45.14	40.0
Right of Way > ROW Right of Way Lines	MAINLINE	200+00	-40.0	206+76.86	-40.0
Right of Way > ROW Right of Way Lines	MAINLINE	207+63.93	-40.0	211+54.06	-40.0
Right of Way > TMPEAS Temporary Easements	MAINLINE	200+00	45.0	213+45.14	45.0
Right of Way > ROW Right of Way Lines	REDBUD	0+38.48	42.0	1+44.20	42.0
Right of Way > ROW Right of Way Lines	REDBUD	0+41.69	-45.0	1+67.58	-45.0

Step 8. Use generic MicroStation commands (Place Line, Copy Parallel, etc.) to develop the two **Permanent Easements** shown below. The width's can be whatever you desire. When completed, disable Place Influence, then close D&C Manager.

Note: Use item **Right of Way > PRMEAS Permanent Easements**



Step 9. **Exit** MicroStation.

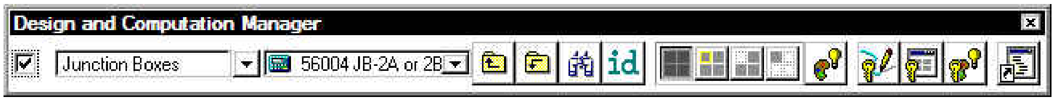
5.3B Drawing Traffic Features

We are going to develop traffic features for our proposed roadway project.

To perform these tasks, two specific GEOPAK tools will be utilized: **D&C Manager** to determine element symbology and the **DP Station/Offset** tool to place the traffic cells at specific stations and offsets. Because of time constraints, we will not develop the planametrics for the entire project, but just for a select area.

Step 1. Navigate to the item **Traffic > Proposed > Junction Boxes > 56004 JB-2A or 2B Junction Box**.

Step 2. If desired, click on the **Switch to Toolbox Mode** (left most icon) icon on D&C Manager.



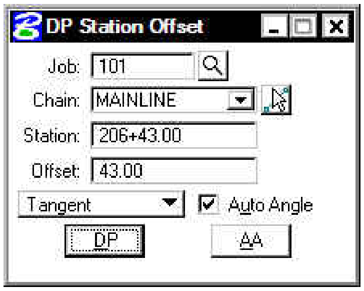
Design and Computation Manager

☑ Junction Boxes

56004 JB-2A or 2B

NOTE: Place Influence must be toggled on in order for items to be computed.

Step 3. Open the **DP Station/Offset** tool from the **Plan View Design** palette. Fill in the values as shown below.



DP Station Offset

Job: 101

Chain: MAINLINE

Station: 206+43.00

Offset: 43.00

Tangent

☑ Auto Angle

When it is necessary to place elements along an alignment at one of the desired options, (i.e. Tangent), it is cumbersome to keep selecting the **AA** button to set the Active Angle. In this case, simply toggle on **Auto Angle**. When the toggle is on, redundant selection of the **AA** button is unnecessary as GEOPAK will change the active angle automatically every time a new station and offset is keyed in.

Step 4. Next, double click the item **56004 JB-2A or 2B Junction Box** in D&C Manager. This will attach the Junction Box cell to your cursor. **Do not click on the screen**.

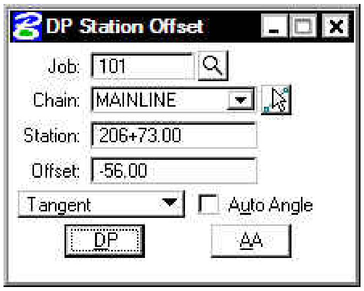
Step 5. Click the **DP** button on the **DP Station/Offset** tool. The Junction Box should be place at the station and offset displayed in the dialog above.

Step 6. Use the previous steps to place the Traffic items listed in the table below.

Note: All items shown in the table fall under the category **Traffic > Proposed.**

Feature	Beg. Station	Beg. Offset
Junction Boxes > 56004 JB-2A or 2B Junction Box	207+31	43.0
Junction Boxes > 56004 JB-2A or 2B Junction Box	206+69	-42.0
Junction Boxes > 56004 JB-2A or 2B Junction Box	206+83	-61.0
Junction Boxes > 56004 JB-2A or 2B Junction Box	207+74	-52.0
Pole Foundations > 51234 Concrete Foundation Signal Pole	206+58	34.0
Pole Foundations > 51234 Concrete Foundation Signal Pole	207+36	38.0
Pole Foundations > 51234 Concrete Foundation Signal Pole	206+76	-49.0

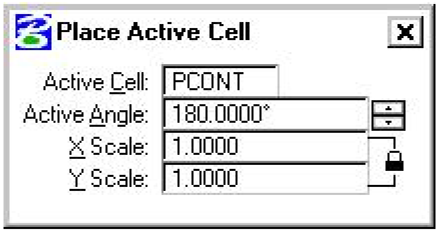
Step 7. Populate the **DP Station/Offset** dialog as shown below.



Job: 101
Chain: MAINLINE
Station: 206+73.00
Offset: -56.00
Tangent
☐ Auto Angle

Step 8. Navigate to the item **Traffic > Proposed > Controllers > 51030 Prop. Controller Cabinet.**

Step 9. Next, double click the item **51030 Prop. Controller Cabinet** in D&C Manager. This will attach the Control Cabinet cell to your cursor. **Do not click on the screen**. Set the **Active Angle** to **180.00** as shown below.



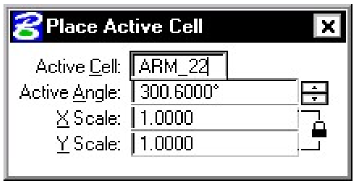
Active Cell: PCONT
Active Angle: 180.0000°
X Scale: 1.0000
Y Scale: 1.0000

Step 10. Click the **DP** button on the **DP Station/Offset** tool. The Controller Cabinet should be place at the station, offset, and angle displayed in the dialogs above.

Step 11. From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View “**POLE1**”.

Step 12. Use D & C Manager to place the **Signal Pole Mast Arm** and **Hanger Assemblies** as shown below.

Set the Active Angle as shown in the dialog box below for placement of the cells.



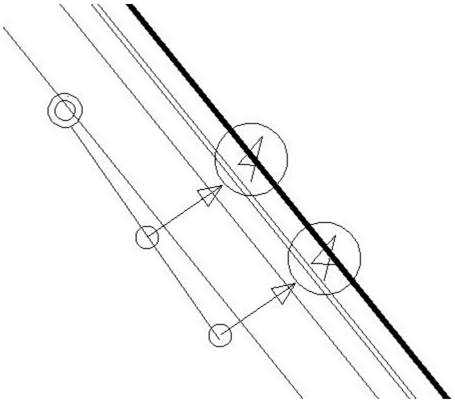
Place Active Cell

Active Cell: ARM_22
Active Angle: 300.6000°
X Scale: 1.0000
Y Scale: 1.0000

Use the following items:

Traffic > Proposed > Signal Pole Mast Arms > 51309 SIG. POLE MP-1 ONE ARM 22FT

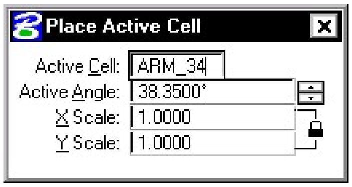
Traffic > Proposed > Hanger Assemblies > 51822 SW -1 or 2, ONE WAY



Step 13. From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View "**POLE2**".

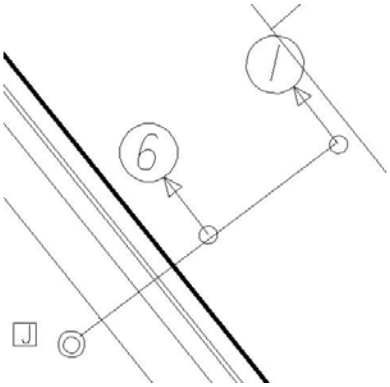
Step 14. Use D & C Manager to place the **Signal Pole Mast Arm** and **Hanger Assemblies** as shown below.

Set the Active Angle as shown in the dialog box below for placement of the cells.



Place Active Cell

Active Cell: ARM_34
Active Angle: 38.3500°
X Scale: 1.0000
Y Scale: 1.0000



Use the following items:

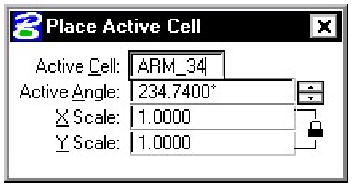
Traffic > Proposed > Signal Pole Mast Arms > 51321 SIG. POLE MP-1 ONE ARM 34FT

Traffic > Proposed > Hanger Assemblies > 51822 SW -1 or 2, ONE WAY

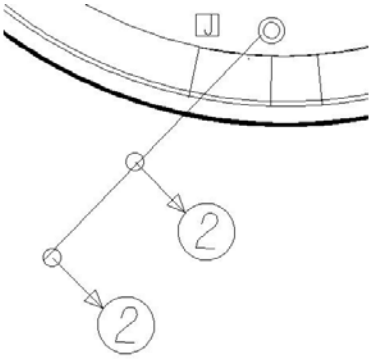
Step 15. From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View "**POLE3**".

Step 16. Use D & C Manager to place the **Signal Pole Mast Arm** and **Hanger Assemblies** as shown below.

Set the Active Angle as shown in the dialog box below for placement of the cells.


Place Active Cell

Active Cell: ARM_34
Active Angle: 234.7400°
X Scale: 1.0000
Y Scale: 1.0000



Use the following items:

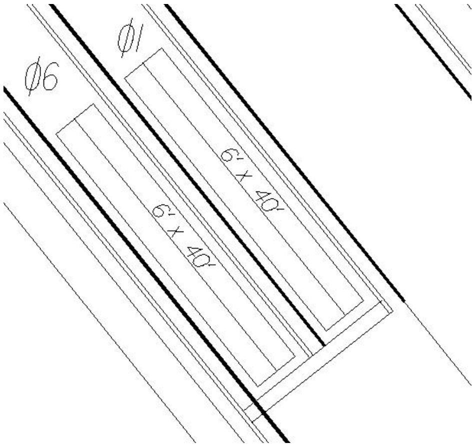
Traffic > Proposed > Signal Pole Mast Arms > 51321 SIG. POLE MP-1 ONE ARM 34FT

Traffic > Proposed > Hanger Assemblies > 51822 SW -1 or 2, ONE WAY

Step 17. From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View "**LOOP1**".

Step 18. Use D & C Manager to place the **Loop Detectors** as shown below in any location you desire. The **DP Station/Offset** tool can be used to set the Active Angle for placement of the cells. Use the following item:

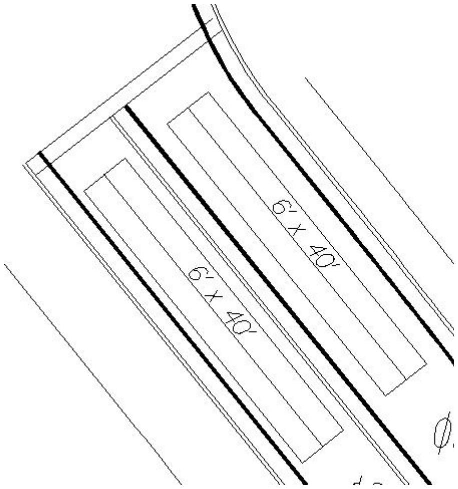
Traffic > Proposed > Loop Detectors > 51540 6 x 40 Prop. Loop Detector



Step 19. From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View "**LOOP2**".

Step 20. Use D & C Manager to place the **Loop Detectors** as shown below in any location you desire. The **DP Station/Offset** tool can be used to set the Active Angle for placement of the cells. Use the following item:

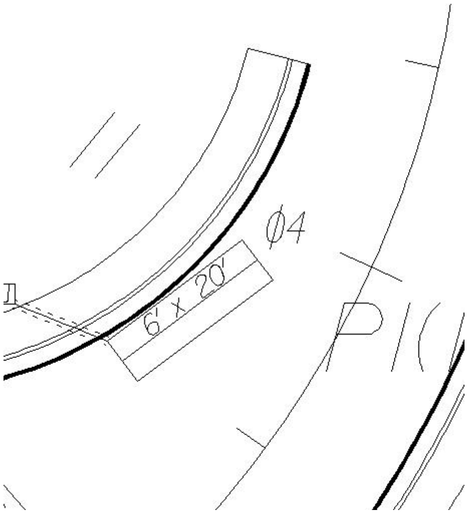
Traffic > Proposed > Loop Detectors > 51540 6 x 40 Prop. Loop Detector



Step 21. From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View "**LOOP3**".

Step 22. Use D & C Manager to place the **Loop Detectors** as shown below in any location you desire. Set the Active Angle at any angle you desire. Use the following item:

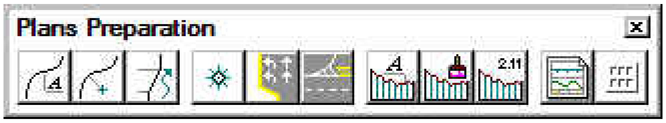
Traffic > Proposed > Loop Detectors > 51540 6 x 20 Prop. Loop Detector



Step 23. **Exit** MicroStation.

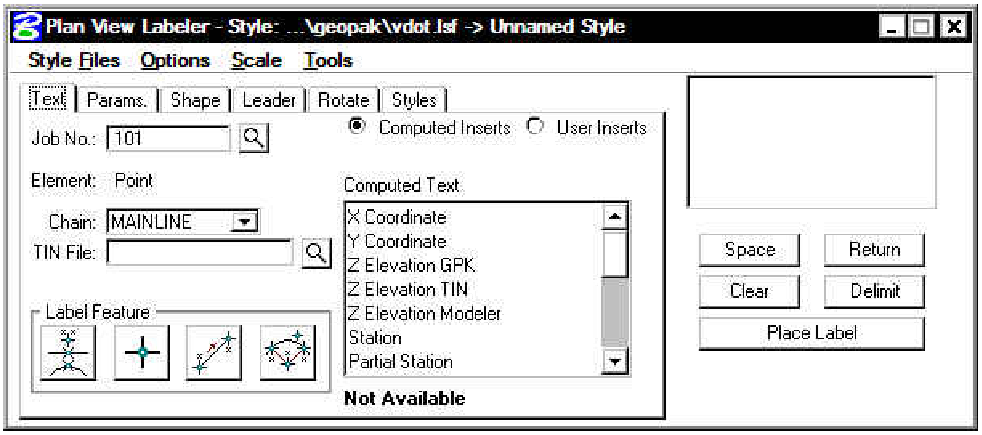
Labeling

6.1 Introduction

Objectives	Learn how to label plan information with Plan View Labeler. Familiarize the user with the Cross Section Labeler.
Project Manager	Plan View Design
Tools	 Plans Preparation
Menu Bar Application	GEOPAK Road > Plans Preparation > Plan View Labeling GEOPAK Road > Plans Preparation > Profile Labeling GEOPAK Road > Cross Sections > Labeling

6.2 Plan View Labeling

GEOPAK’s labeling tools allow a user to place “smart” labels in a MicroStation drawing. These labels have the ability to calculate XYZ coordinates, station, offset, direction, length, radius, degree of curvature, etc. of the associated element. When the **Plan View Labeling** icon is selected, the dialog box depicted below is displayed.


Plan View Labeler - Style: ...\geopak\vdot.lsf -> Unnamed Style
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Computed Text
X Coordinate
Y Coordinate
Z Elevation GPK
Z Elevation TIN
Z Elevation Modeler
Station
Partial Station
Label Feature
Space
Return
Clear
Delimit
Place Label

Job No.: 101

Element: Point

Chain: MAINLINE

TIN File:

● Computed Inserts ○ User Inserts

Not Available

The label to be placed is displayed in the box on the right side of the dialog box as shown above. The **Space** button places a space in the label at the cursor position. The **Return** button starts a new line of text. The **Clear** button starts a new label. The **Delimit** button places a line above or below a line of text. The **Place Label** button attaches the label to the cursor for placement in the drawing.

The user can select the various tabs to define / modify the label appearance.

6.2.1 Text

For data to be computed, the job number and the chain need to be selected. If elevations are to be calculated, a TIN file needs to be chosen.

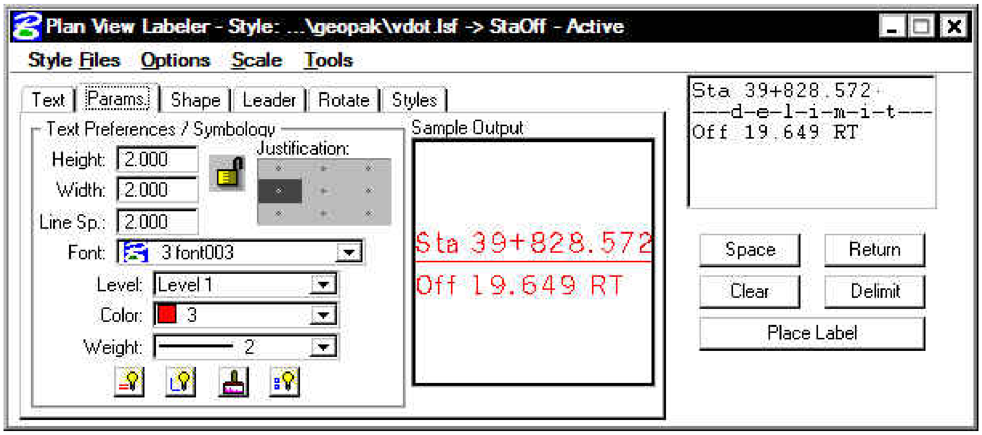
The **Computed Inserts** are items that Geopak has the ability to calculate for the chosen item. The list of **Computed Inserts** changes with the type of element that is chosen. If a line is chosen, the list of **Computed Inserts** will show inserts of bearing, and length. If a curve is chosen the list of **Computed Inserts** will change to show inserts of radius, curvature, chord length, etc.

The **User Inserts** are inserts that a user may use on a regular basis. This list can be customized for a specific user's needs.

There are several methods allowing the user to choose the element to use for calculations in the label.

Select GEOPAK or MicroStation Element	Allows the user to identify either a COGO or MicroStation element for labeling.
Data Point Location	Selects a location in the design file that may or may not be associated with an element.
2 GPK Point Line	Selecting lines or points that have been visualized via COGO.
3 GPK Point Arc	Selection of visualized arcs and points

6.2.2 Params.


Plan View Labeler - Style: ...\geopak\vdot.lsf -> StaOff - Active
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Text Preferences / Symbology
Justification:
Sample Output
Space
Return
Clear
Delimit
Place Label

Height: 2.000
Width: 2.000
Line Sp.: 2.000
Font: 3 font003
Level: Level 1
Color: 3
Weight: 2

Sta 39+828.572
Off 19.649 RT

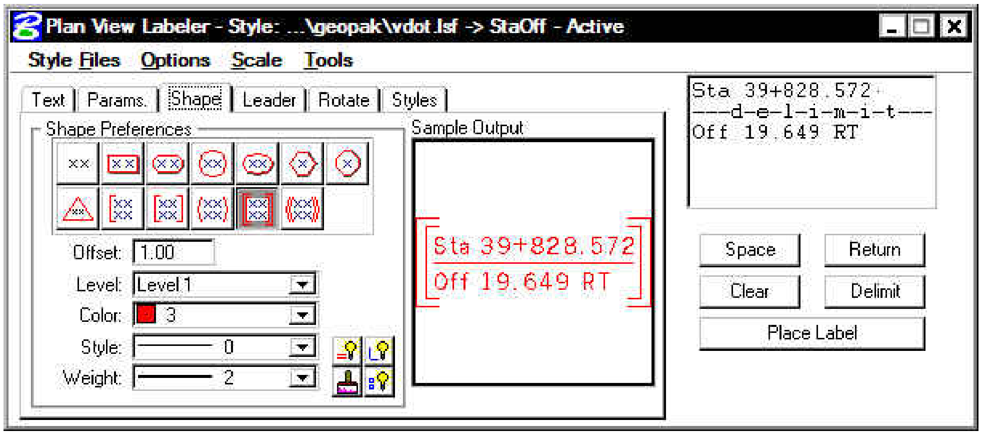
```
Sta 39+828.572
---d-e-l-i-m-i-t---
Off 19.649 RT
```

The **Parameters** tab enables the user set up the text size and symbology for the label.

By Current sets the symbology to the current MicroStation settings. **By Element** allows the user to set the symbology by choosing a MicroStation element. **Set All** sets the symbology for all elements in the label (text, delimiters, leader lines, etc.).

By Current	After pressing this button, GEOPAK determines the active MicroStation symbology (level, weight, color and style) and populates the dialog.
By Element	After pressing this button, GEOPAK prompts to select a previously drawn MicroStation element, and populates the dialog with its element symbology.
D & C Symbology	Pressing this button invokes the Design and Computation Manager, wherein the desired item may be selected. By double clicking on an Item, the associated element symbology within the Design and Computation Manager is applied to the Labeling dialog.
Set All	GEOPAK reads the current settings (level, weight, color and style) within the dialog, and populates the Parameter, Shape and Leader dialogs.

6.2.3 Shape


Plan View Labeler - Style: ...\geopak\vdot.lsf -> StaOff - Active
Style Files Options Scale Tools
Text Params. Shape Leader Rotate Styles
Shape Preferences
Sample Output
Space Return
Clear Delimit
Place Label

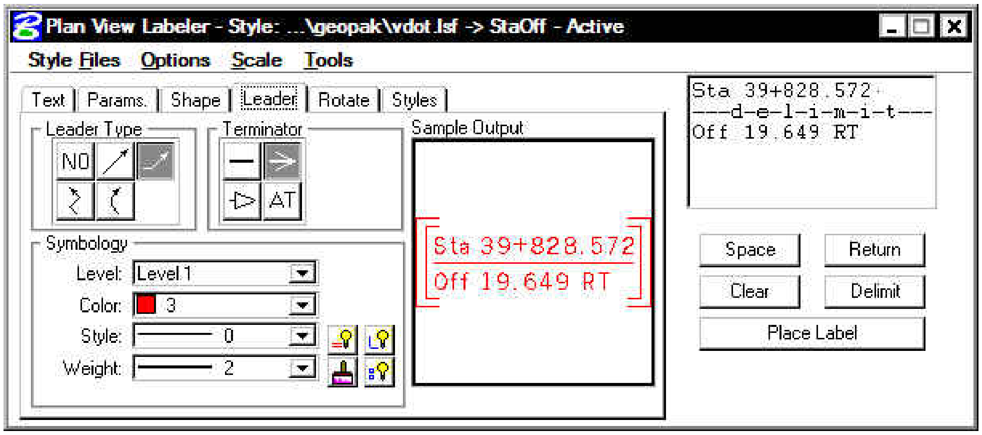
Offset: 1.00
Level: Level 1
Color: 3
Style: 0
Weight: 2

```
Sta 39+828.572
---d-e-l-i-m-i-t---
Off 19.649 RT
```

Sta 39+828.572
Off 19.649 RT

The **Shape** tab allows the user to place a shape around the label, and set the symbology for the shape.

6.2.4 Leader


Plan View Labeler - Style: ...\geopak\vdot.lsf -> StaOff - Active
Style Files Options Scale Tools
Text Params. Shape Leader Rotate Styles
Leader Type
NO
Terminator
AT
Symbology
Sample Output
Space Return
Clear Delimit
Place Label

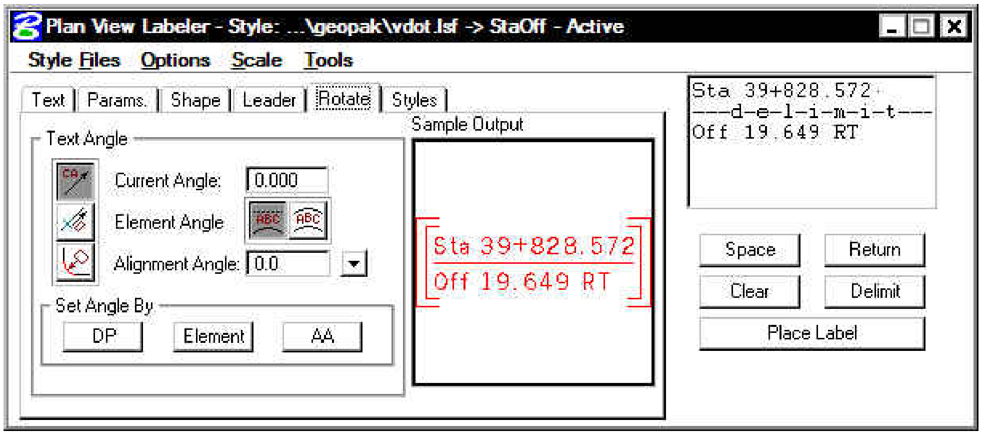
Level: Level 1
Color: 3
Style: 0
Weight: 2

```
Sta 39+828.572
---d-e-l-i-m-i-t---
Off 19.649 RT
```

Sta 39+828.572
Off 19.649 RT

The **Leader** tab allows the user to attach a leader from the label to the point. Different leader types and terminators can be chosen. The active terminator can also be used.

6.2.5 Rotate



Plan View Labeler - Style: ...\geopak\vdot.lsf -> StaOff - Active

Current Angle: 0.000

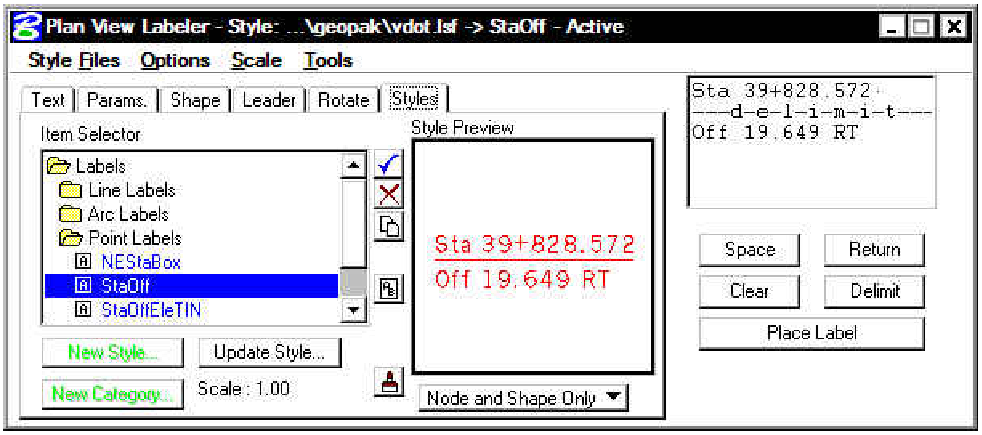
Alignment Angle: 0.0

```
Sta 39+828.572
---d-e-l-i-m-i-t---
Off 19.649 RT
```

Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Text Angle
Element Angle
Set Angle By
DP
Element
AA
Sample Output
Sta 39+828.572
Off 19.649 RT
Space
Return
Clear
Delimit
Place Label

The **Rotate** tab allows the label to be rotated. The rotation can be determined from the current angle, the angle of the element, or the alignment angle. The angle can also be set by two data points (first data point set the location, next data point sets the angle) or the active angle.

6.2.6 Styles



Plan View Labeler - Style: ...\geopak\vdot.lsf -> StaOff - Active

```
Sta 39+828.572
---d-e-l-i-m-i-t---
Off 19.649 RT
```

Scale : 1.00

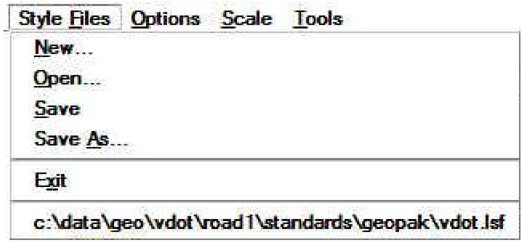
Node and Shape Only

Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Item Selector
Labels
Line Labels
Arc Labels
Point Labels
NEStaBox
StaOff
StaOffEleTIN
New Style...
Update Style...
New Category...
Style Preview
Sta 39+828.572
Off 19.649 RT
Space
Return
Clear
Delimit
Place Label

The **Styles** tab allows a user to choose label symbology from a library of pre-defined styles. When the user chooses the style, all symbology, leaders, shapes, etc. is set up for the user.

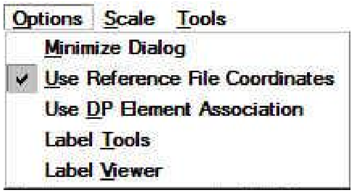
6.2.7 Menus

The **Style Files** menu allows the user to open a new style library. You must be under the Styles tab in order to open a style library.

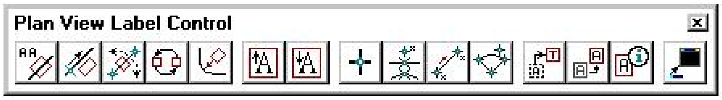


Style Files
Options
Scale
Tools
New...
Open...
Save
Save As...
Exit
c:\data\geo\vdot\road1\standards\geopak\vdot.lsf

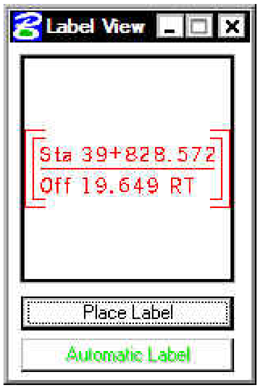
In the **Options** menu, **Minimize Dialog Box** will minimize the dialog box when **Place Label** is chosen. The **Use Reference File Coordinates** option uses the coordinates from the master plan view file when placing a label in a plan sheet.


Options
Scale
Tools
Minimize Dialog
✓ Use Reference File Coordinates
Use DP Element Association
Label Tools
Label Viewer

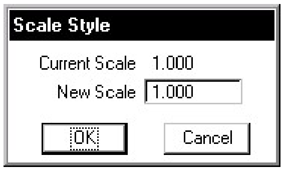
Options > Label Tools invokes the tool frame shown below which enables the user to modify Geopak labels.


Plan View Label Control

Options > Label Viewer brings up a dialog box that allows a user to view and place a label.


Label View
Sta 39+828.572
Off 19.649 RT
Place Label
Automatic Label

The **Scale > Scale Style** menu allows the user to choose a plan scale. All labels will be adjusted according to the plan scale. The user simply keys in a scale, and chooses a **Labeling Style**. The corresponding label will be placed at the correct size for the scale that was chosen.

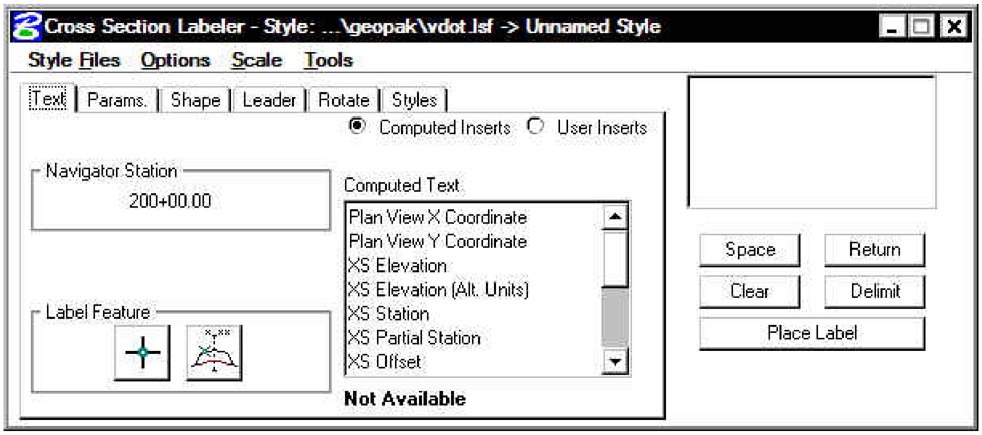

Scale Style

Current Scale 1.000
New Scale 1.000

OK
Cancel

6.3 Cross Section Labeling

The **Cross Section Labeling** dialog box differs from the **Plan View Labeling** dialog box only on the text tab. **Cross Section Labeling** works with the **Cross Section Navigator**. The current **Cross Section Navigator** station is shown on the **Text** tab. The **Computed** and **User Inserts** contain values and phrases related to cross-sections.


Cross Section Labeler - Style: ...\geopak\vdot.lsf -> Unnamed Style
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Space
Return
Clear
Delimit
Place Label

● Computed Inserts ○ User Inserts

Navigator Station: 200+00.00

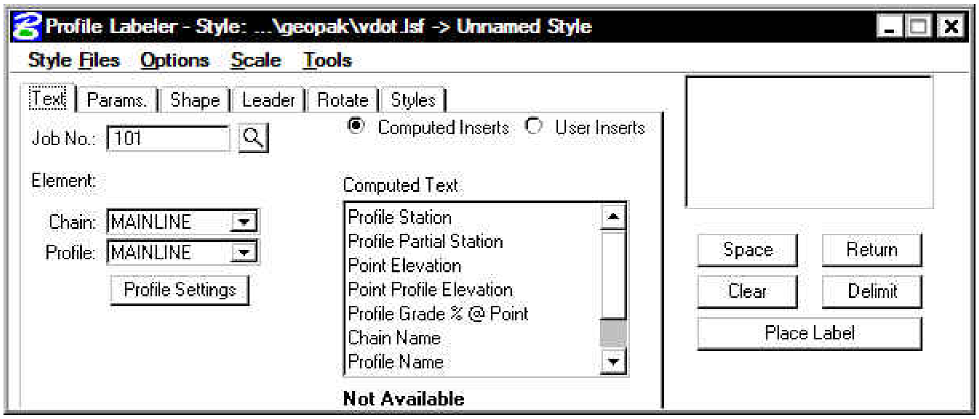
Label Feature

Computed Text:
- Plan View X Coordinate
- Plan View Y Coordinate
- XS Elevation
- XS Elevation (Alt. Units)
- XS Station
- XS Partial Station
- XS Offset

Not Available

6.4 Profile Labeling

The **Profile Labeling** dialog box differs from the **Plan View Labeling** dialog box only on the text tab. The Chain and Profile must be defined, in addition to profile settings. The **Computed** and **User Inserts** contain values and phrases related to profiles.


Profile Labeler - Style: ...\geopak\vdot.lsf -> Unnamed Style
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Profile Settings
Space
Return
Clear
Delimit
Place Label

Job No.: 101

Element:

Chain: MAINLINE

Profile: MAINLINE

● Computed Inserts ○ User Inserts

Computed Text:
- Profile Station
- Profile Partial Station
- Point Elevation
- Point Profile Elevation
- Profile Grade % @ Point
- Chain Name
- Profile Name

Not Available

LAB 6A: Right Of Way Labeling

6A.1 Accessing the Labeler

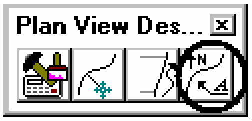
Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB6.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\vdot\PlansPrep\d17682des.dgn.**

Step 3. Access **Project Manager**.

Step 4. Select the icon **Plan View Design** button from the **Road Project: Road1.prj** workflow dialog box.

Step 5. From the Plan View Design tool bar, select the Plan View Labeler icon.

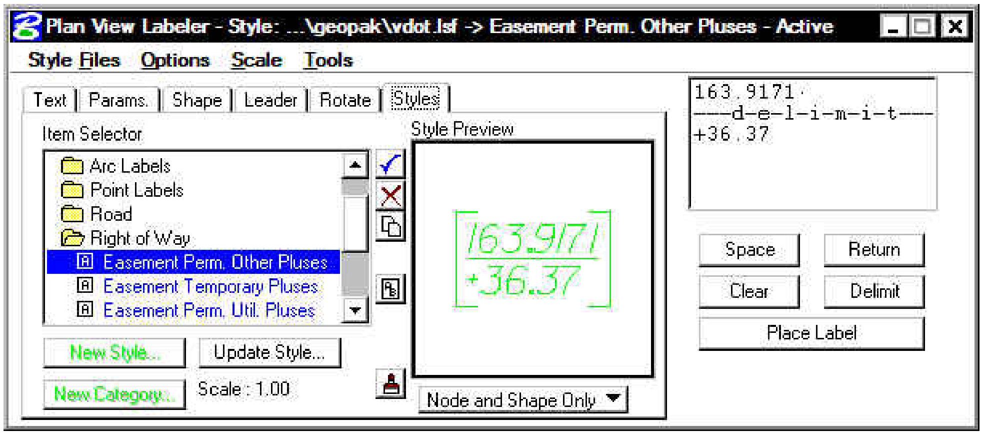

Plan View Des...

6A.2 Using Predefined Label Styles

In the following steps we will use the Plan View Labeler to label Permanent Easements.

Step 1. Click on the **Styles** tab.

Step 2. Traverse with the Item Selector box to locate the following style: **Labels > Right of Way > Easement Perm. Other Pluses**. Next, double click the **Easement Perm. Other Pluses** style.

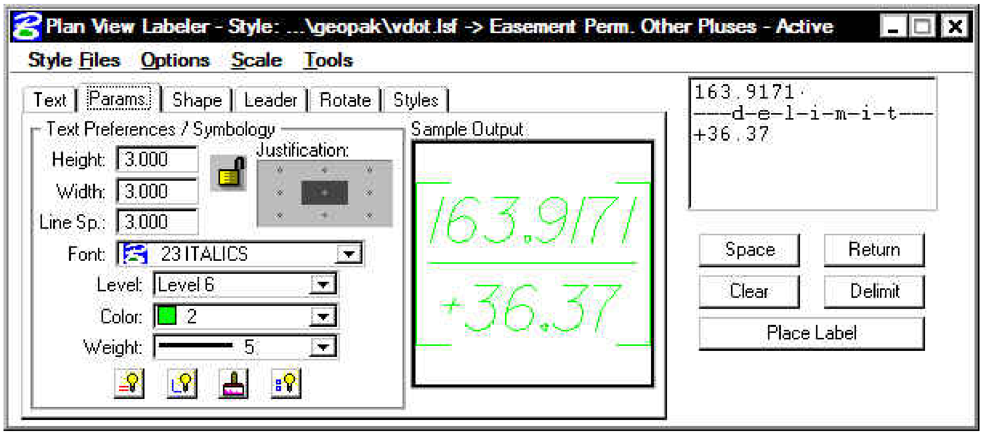

Plan View Labeler - Style: ...\geopak\vdot.lsf -> Easement Perm. Other Pluses - Active
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Item Selector
Arc Labels
Point Labels
Road
Right of Way
Easement Perm. Other Pluses
Easement Temporary Pluses
Easement Perm. Util. Pluses
New Style...
Update Style...
New Category...
Scale : 1.00
Style Preview
163.9171
+36.37
Node and Shape Only
Space
Return
Clear
Delimit
Place Label

```
163.9171
---d-e-l-i-m-i-t---
+36.37
```

Step 3. Click on the **Text** tab and complete as defined below:

Job No.	101
Chain	MAINLINE
TIN File	SURVEY.TIN

Step 4. Click on the **Params.** tab and complete as defined below:



Plan View Labeler - Style: ...\geopak\vdot.lsf -> Easement Perm. Other Pluses - Active

Text Preferences / Symbology

Height: 3.000

Width: 3.000

Line Sp.: 3.000

Font: 23 ITALICS

Level: Level 6

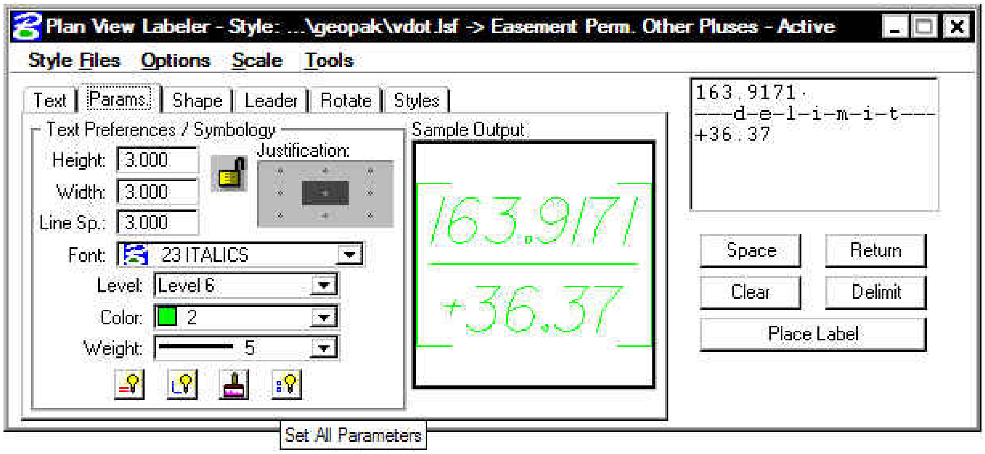
Color: 2

Weight: 5

```
163.9171
---d-e-l-i-m-i-t---
+36.37
```

Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Justification:
Sample Output
163.9171
+36.37
Space
Return
Clear
Delimit
Place Label

Step 5. Click the **Set All Parameters** icon. This will set the symbology for the rest of the label to match the text.



Plan View Labeler - Style: ...\geopak\vdot.lsf -> Easement Perm. Other Pluses - Active

Text Preferences / Symbology

Height: 3.000

Width: 3.000

Line Sp.: 3.000

Font: 23 ITALICS

Level: Level 6

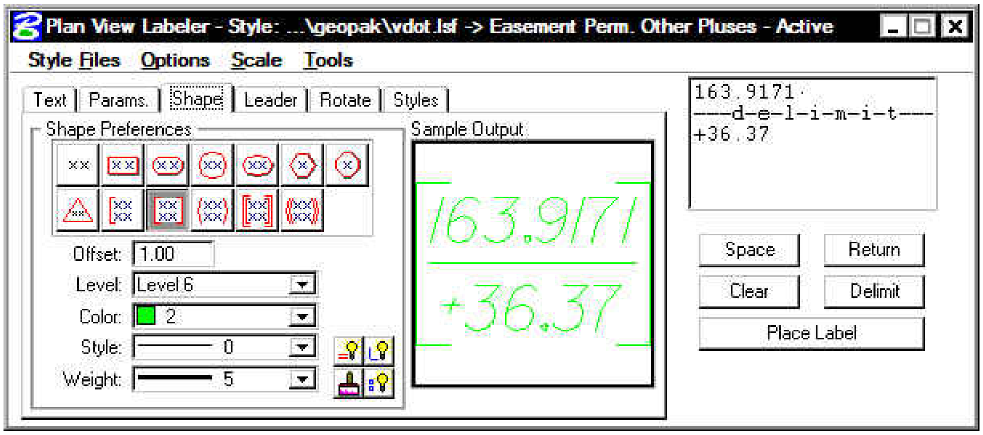
Color: 2

Weight: 5

```
163.9171
---d-e-l-i-m-i-t---
+36.37
```

Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Justification:
Sample Output
163.9171
+36.37
Space
Return
Clear
Delimit
Place Label
Set All Parameters

Step 6. Click on the **Shape** tab and set the **Offset** to **1.00**:



Plan View Labeler - Style: ...\geopak\vdot.lsf -> Easement Perm. Other Pluses - Active

Shape Preferences

Offset: 1.00

Level: Level 6

Color: 2

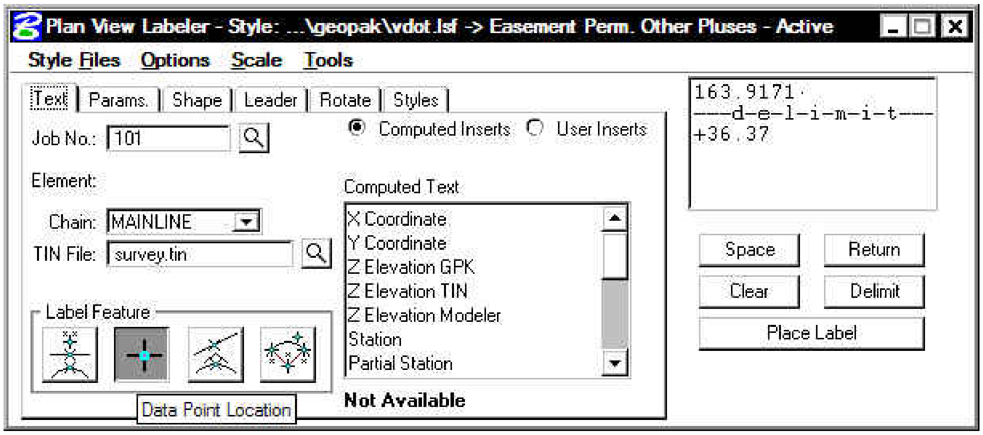
Style: 0

Weight: 5

```
163.9171
---d-e-l-i-m-i-t---
+36.37
```

Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Sample Output
163.9171
+36.37
Space
Return
Clear
Delimit
Place Label

Step 7. Click on the **Text** tab. To create a label, select the **Data Point Location** button and then identify the location desired for the location of the label. The labeler automatically calculates the information.



Plan View Labeler - Style: ...\geopak\vdot.lsf -> Easement Perm. Other Pluses - Active

Job No.: 101

Chain: MAINLINE

TIN File: survey.tin

● Computed Inserts ○ User Inserts

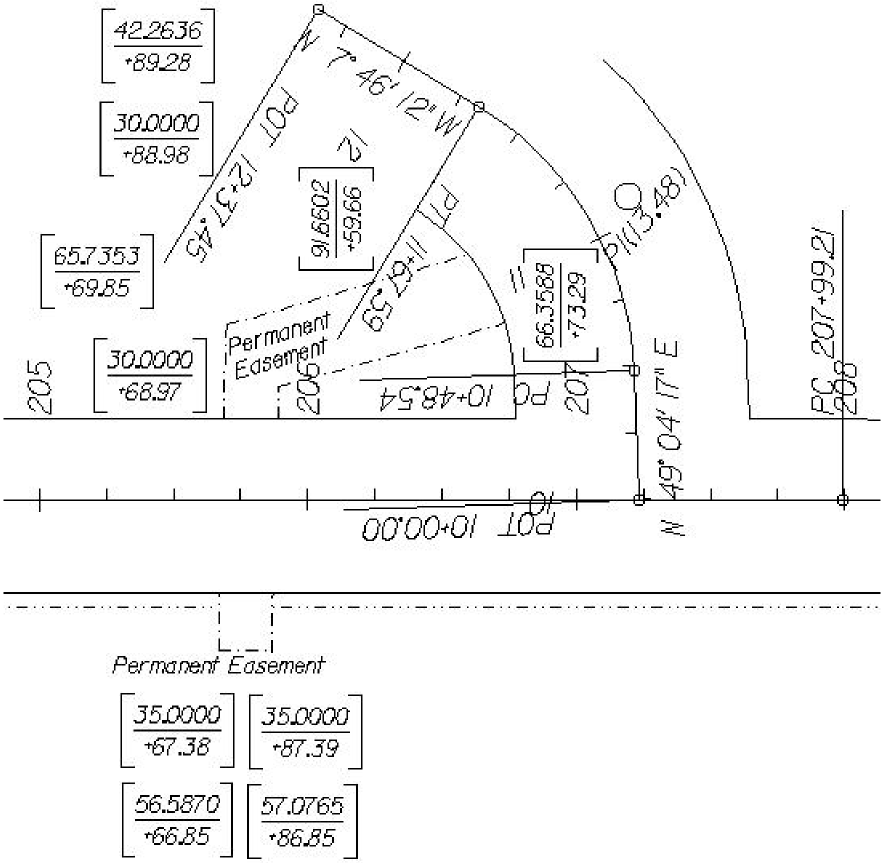
Computed Text: X Coordinate, Y Coordinate, Z Elevation GPK, Z Elevation TIN, Z Elevation Modeler, Station, Partial Station

Not Available

```
163.9171
---d-e-l-i-m-i-t---
+36.37
```

Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Element:
Label Feature
Data Point Location
Space
Return
Clear
Delimit
Place Label

Use the image below as a sample for placement of the labels.



42.2636
+89.28
30.0000
+88.98
65.7353
+69.85
30.0000
+68.97
N 7° 46' 12" W
POT 12+37.45
91.6602
+59.66
12
PT
11+67.59
Permanent Easement
66.3588
+73.29
PI(13+48)
PC 207+99.21
205
206
207
208
PC 10+48.54
N 49° 04' 17" E
POT 10+00.00
10
Permanent Easement
35.0000
+67.38
35.0000
+87.39
56.5870
+66.85
57.0765
+86.85

Step 8. Exit the **Plan View Labeler**.

6A.3 Use Special Application to Label Right Of Way and Easements

In the following steps we will use a special application to label Right Of Way and Easements.

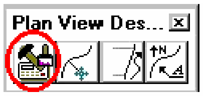
Note: In order to use this special application to label Right Of Way, the elements to be labeled must be placed in a MicroStation selection set.

6A.3.1 Label Proposed Right Of Way for Chain MAINLINE

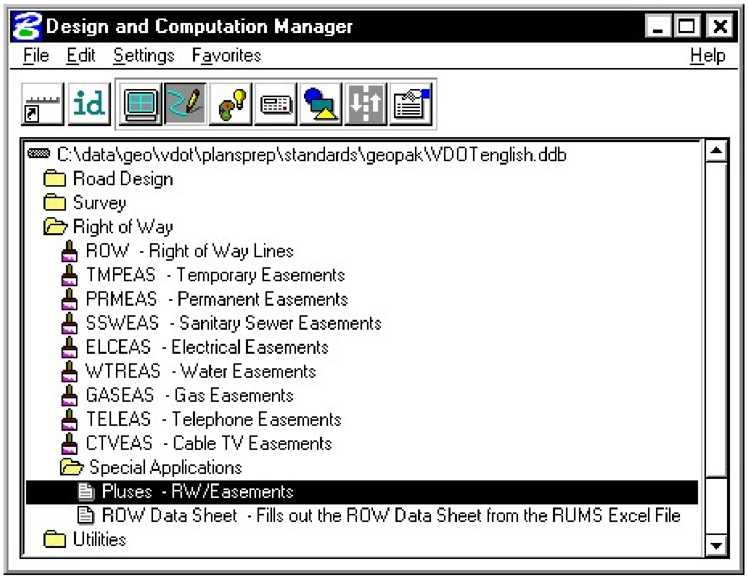
Step 1. From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View “**ROW1**”.

Step 2. Place the **Proposed Right Of Way** for chain **MAINLINE** in a MicroStation selection set.

Step 3. Invoke **Design and Computation Manager** from the **Plan View Design** tool frame shown below.



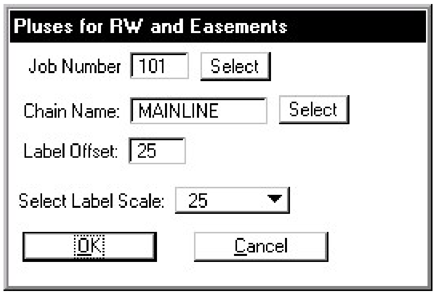
Step 4. Select the **Design** mode then navigate to **Right of Way > Special Applications > Pluses – RW/Easements.**



C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
  - ROW - Right of Way Lines
  - TMPEAS - Temporary Easements
  - PRMEAS - Permanent Easements
  - SSWEAS - Sanitary Sewer Easements
  - ELCEAS - Electrical Easements
  - WTREAS - Water Easements
  - GASEAS - Gas Easements
  - TELEAS - Telephone Easements
  - CTVEAS - Cable TV Easements
  - Special Applications
    - Pluses - RW/Easements
    - ROW Data Sheet - Fills out the ROW Data Sheet from the RUMS Excel File
- Utilities

Step 5. **Double-Click** on the item to kick off the application.

Step 6. Populate the dialog box as below then click **OK**.



Pluses for RW and Easements

Job Number: 101

Chain Name: MAINLINE

Label Offset: 25

Select Label Scale: 25

NOTE: Job Number and Chain Name can be entered by using the **Select** buttons.

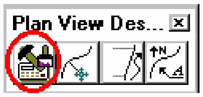
The Offset and Station labels should be placed along the proposed Right Of Way for chain MAINLINE. They can be moved to a new location if you desire.

6A.3.2 Label Proposed Right Of Way for Chain REDBUD

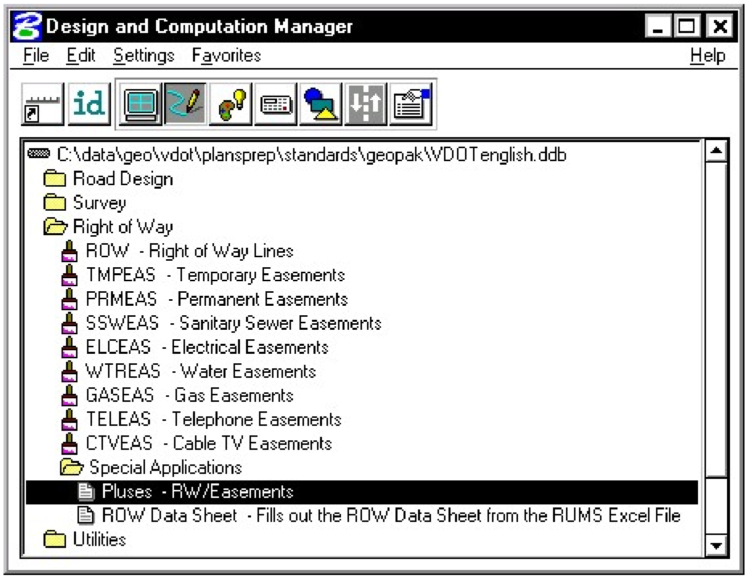
Step 1. From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View "**ROW2**".

Step 2. Place the **Proposed Right Of Way** for chain **REDBUD** in a MicroStation selection set.

Step 3. Invoke **Design and Computation Manager** from the **Plan View Design** tool frame shown below.



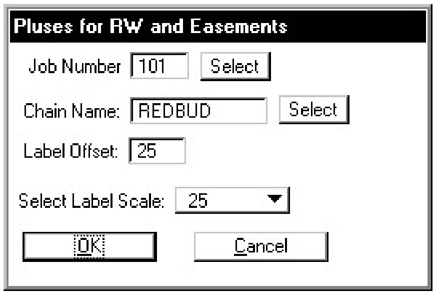
Step 4. Select the **Design** mode then navigate to **Right of Way > Special Applications > Pluses – RW/Easements**.



C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
  - ROW - Right of Way Lines
  - TMPEAS - Temporary Easements
  - PRMEAS - Permanent Easements
  - SSWEAS - Sanitary Sewer Easements
  - ELCEAS - Electrical Easements
  - WTREAS - Water Easements
  - GASEAS - Gas Easements
  - TELEAS - Telephone Easements
  - CTVEAS - Cable TV Easements
  - Special Applications
    - Pluses - RW/Easements
    - ROW Data Sheet - Fills out the ROW Data Sheet from the RUMS Excel File
- Utilities

Step 5. **Double-Click** on the item to kick off the application.

Step 6. Populate the dialog box as below then click **OK**.



Pluses for RW and Easements

Job Number: 101

Chain Name: REDBUD

Label Offset: 25

Select Label Scale: 25

NOTE: Job Number and Chain Name can be entered by using the **Select** buttons.

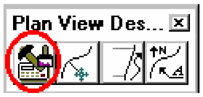
The Offset and Station labels should be placed along the proposed Right Of Way for chain REDBUD. They can be moved to a new location if you desire.

6A.3.3 Label Temporary Easement for Chain MAINLINE

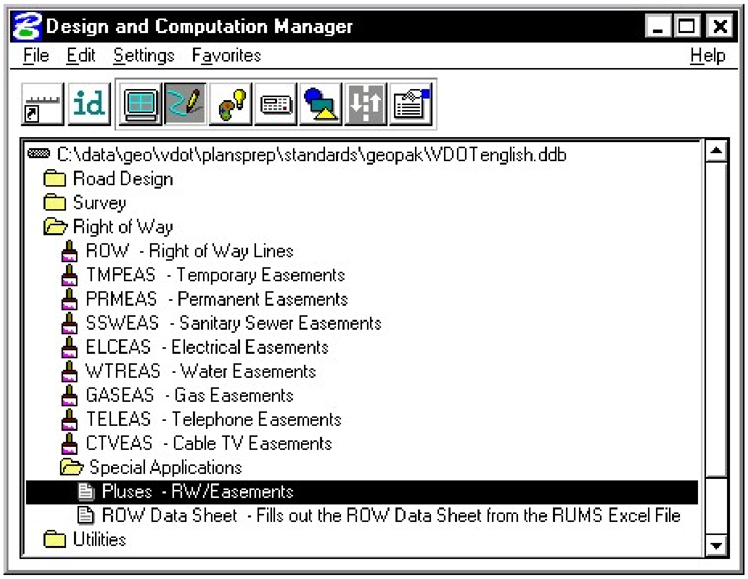
Step 1. From the MicroStation menu bar select **Utilities > Saved Views**, access the Saved View "**ROW1**".

Step 2. Place the **Temporary Easement** for chain **MAINLINE** in a MicroStation selection set.

Step 3. Invoke **Design and Computation Manager** from the **Plan View Design** tool frame shown below.



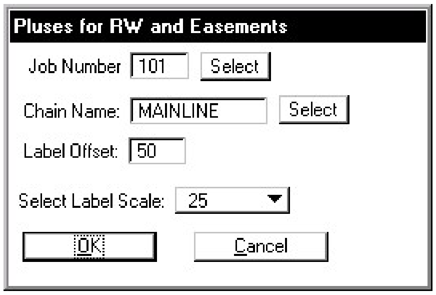
Step 4. Select the **Design** mode then navigate to **Right of Way > Special Applications > Pluses – RW/Easements.**



C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
  - ROW - Right of Way Lines
  - TMPEAS - Temporary Easements
  - PRMEAS - Permanent Easements
  - SSWEAS - Sanitary Sewer Easements
  - ELCEAS - Electrical Easements
  - WTREAS - Water Easements
  - GASEAS - Gas Easements
  - TELEAS - Telephone Easements
  - CTVEAS - Cable TV Easements
  - Special Applications
    - Pluses - RW/Easements
    - ROW Data Sheet - Fills out the ROW Data Sheet from the RUMS Excel File
- Utilities

Step 5. **Double-Click** on the item to kick off the application.

Step 6. Populate the dialog box as below then click **OK**.


Pluses for RW and Easements

Job Number 101

Chain Name: MAINLINE

Label Offset: 50

Select Label Scale: 25

NOTE: Job Number and Chain Name can be entered by using the **Select** buttons.

The Offset and Station labels should be placed along the Temporary Easement for chain MAINLINE. They can be moved to a new location if you desire.

LAB 6B: Traffic Labeling

6B.1 Accessing the Labeler

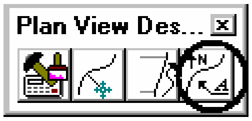
Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB6.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\vdot\PlansPrep\d17682Traffic.dgn.**

Step 3. Access **Project Manager**.

Step 4. Select the icon **Plan View Design** button from the **Road Project: Road1.prj** workflow dialog box.

Step 5. From the Plan View Design tool bar, select the Plan View Labeler icon.

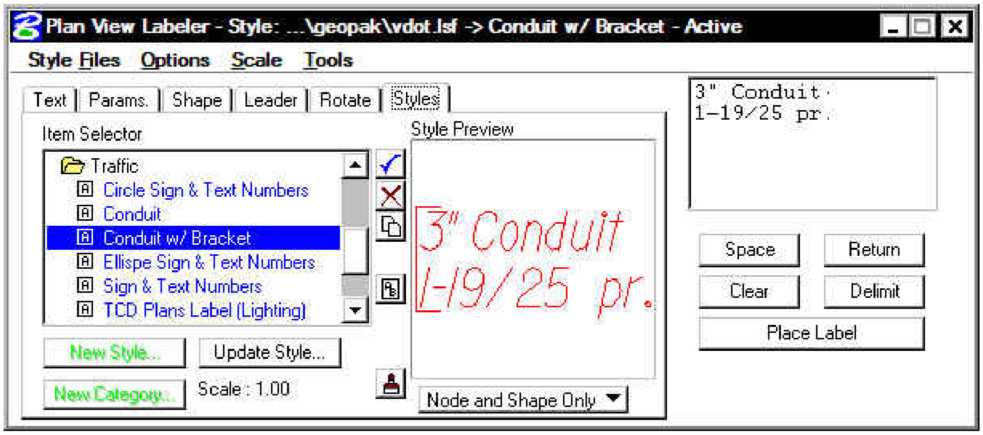

Plan View Des...

6B.2 Using Predefined Label Styles

In the following steps we will use the Plan View Labeler to label Conduit.

Step 1. Click on the **Styles** tab.

Step 2. Traverse with the Item Selector box to locate the following style: **Labels > Traffic > Conduit w/ Bracket**. Next, double click the **Conduit w/ Bracket** style.

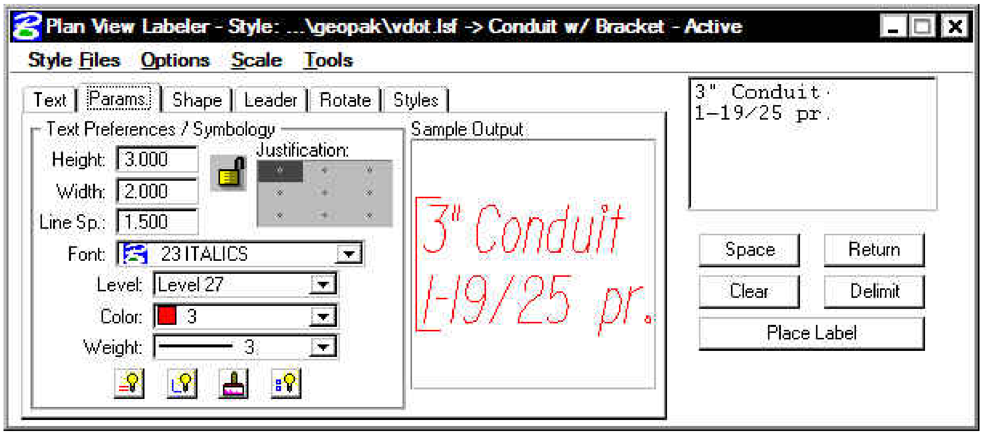

Plan View Labeler - Style: ...\geopak\vdot.lsf -> Conduit w/ Bracket - Active
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Item Selector
Traffic
Circle Sign & Text Numbers
Conduit
Conduit w/ Bracket
Ellispe Sign & Text Numbers
Sign & Text Numbers
TCD Plans Label (Lighting)
New Style...
Update Style...
New Category...
Scale : 1.00
Style Preview
3" Conduit
1-19/25 pr.
Node and Shape Only
Space
Return
Clear
Delimit
Place Label

3" Conduit
1-19/25 pr.

Step 3. Click on the **Text** tab and complete as defined below:

Job No.	101
Chain	MAINLINE
TIN File	SURVEY.TIN

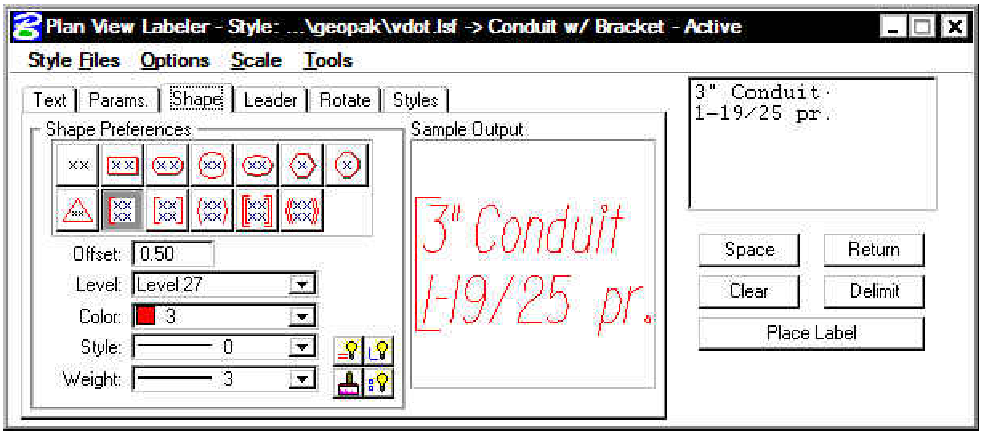
Step 4. Click on the **Params.** tab and complete as defined below:


Plan View Labeler - Style: ...\geopak\vdot.lsf -> Conduit w/ Bracket - Active
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Text Preferences / Symbology
Justification:
Sample Output
Space
Return
Clear
Delimit
Place Label

Height: 3.000
Width: 2.000
Line Sp.: 1.500
Font: 23 ITALICS
Level: Level 27
Color: 3
Weight: 3

3" Conduit
1-19/25 pr.

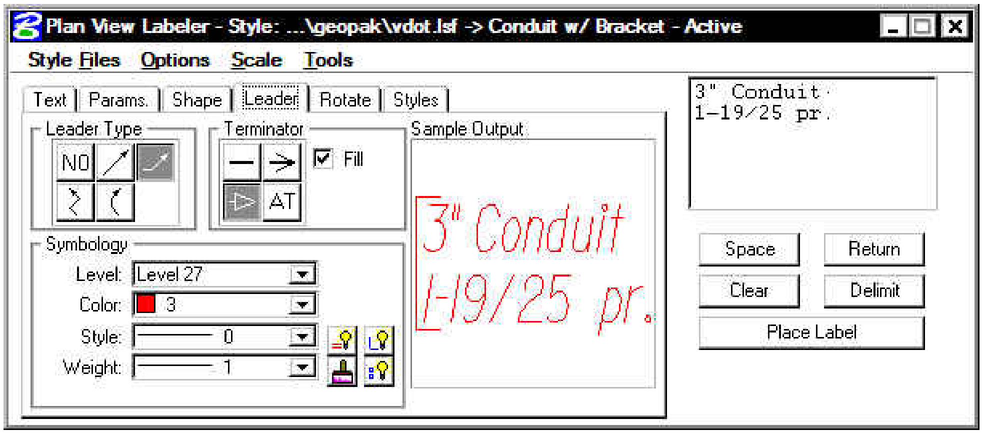
Step 5. Click on the **Shape** tab and complete as defined below:


Plan View Labeler - Style: ...\geopak\vdot.lsf -> Conduit w/ Bracket - Active
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Shape Preferences
Sample Output
Space
Return
Clear
Delimit
Place Label

Offset: 0.50
Level: Level 27
Color: 3
Style: 0
Weight: 3

3" Conduit
1-19/25 pr.

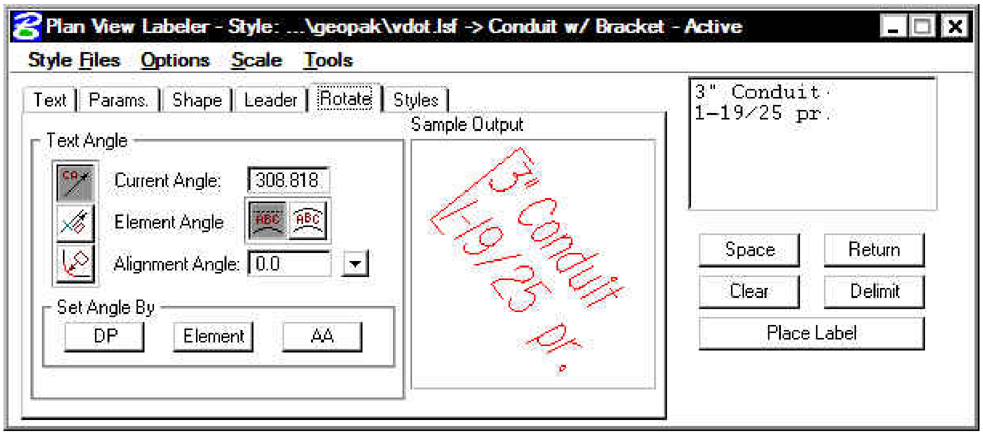
Step 6. Click on the **Leader** tab and complete as defined below:


Plan View Labeler - Style: ...\geopak\vdot.lsf -> Conduit w/ Bracket - Active
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Leader Type
NO
Terminator
AT
Symbology
Sample Output
Space
Return
Clear
Delimit
Place Label

☑ Fill
Level: Level 27
Color: 3
Style: 0
Weight: 1

3" Conduit
1-19/25 pr.

Step 7. Click on the **Rotate** tab. Click the **Element** button under **Set Angle By** then graphically identify chain **MAINLINE**. This will set the angle of the label. The **Plan View Labeler** should appear as below:


Plan View Labeler - Style: ...\geopak\vdot.lsf -> Conduit w/ Bracket - Active
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Text Angle
Element Angle
Set Angle By
DP
Element
AA
Sample Output
Space
Return
Clear
Delimit
Place Label

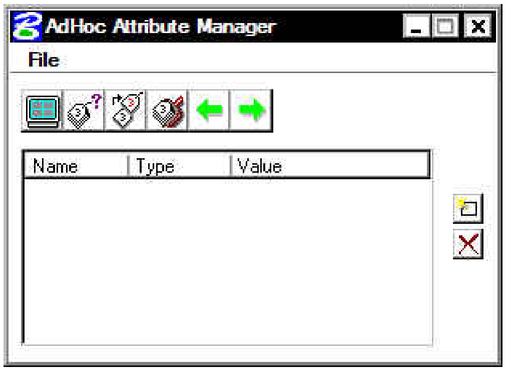
Current Angle: 308.818

Alignment Angle: 0.0

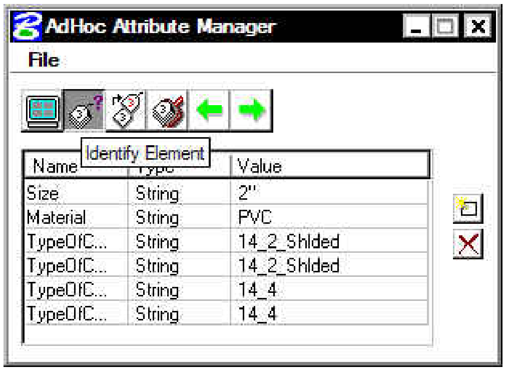
```
3" Conduit
1-19/25 pr.
```

Note: Before we place the label we need to gather some information about the Conduit to be labeled. To gather this information we will be using the **3PC AdHoc Attribute Manager**.

Step 8. From the **Applications** pulldown select **GEOPAK ROAD > GEOPAK Element Attributes > 3PC AdHoc Attribute Manager**. The dialog box below should appear.

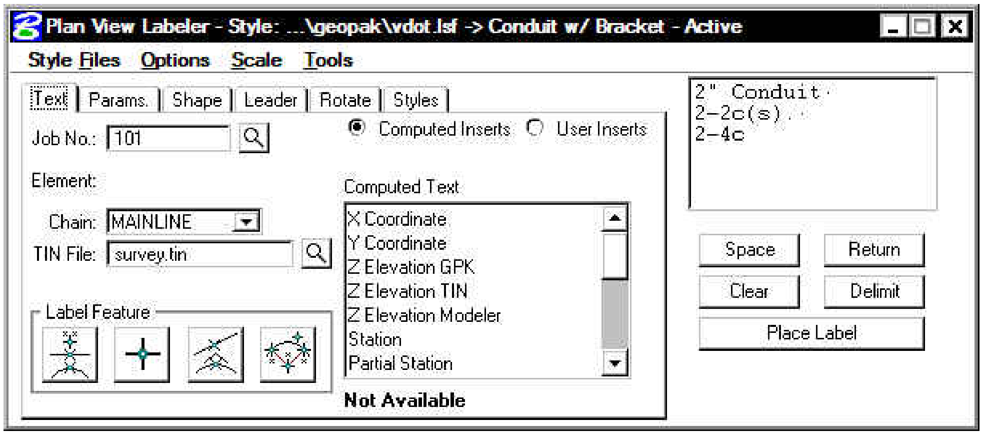

AdHoc Attribute Manager
File
Name
Type
Value

Step 9. Click the **Identify Element** icon on the **3PC AdHoc Attribute Manager** dialog box then graphically identify the conduit labeled **Conduit 1**. The dialog box should be populated as below. We will use this information to compose a label.


AdHoc Attribute Manager
File
Identify Element

Name	Type	Value
Size	String	2"
Material	String	PVC
TypeOfC...	String	14_2_Shlded
TypeOfC...	String	14_2_Shlded
TypeOfC...	String	14_4
TypeOfC...	String	14_4

Step 10. Click on the **Text** tab and complete as defined below:


Plan View Labeler - Style: ...\geopak\vdot.lsf -> Conduit w/ Bracket - Active
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Element:
Computed Text
X Coordinate
Y Coordinate
Z Elevation GPK
Z Elevation TIN
Z Elevation Modeler
Station
Partial Station
Label Feature
Not Available
Space
Return
Clear
Delimit
Place Label

Job No.: 101

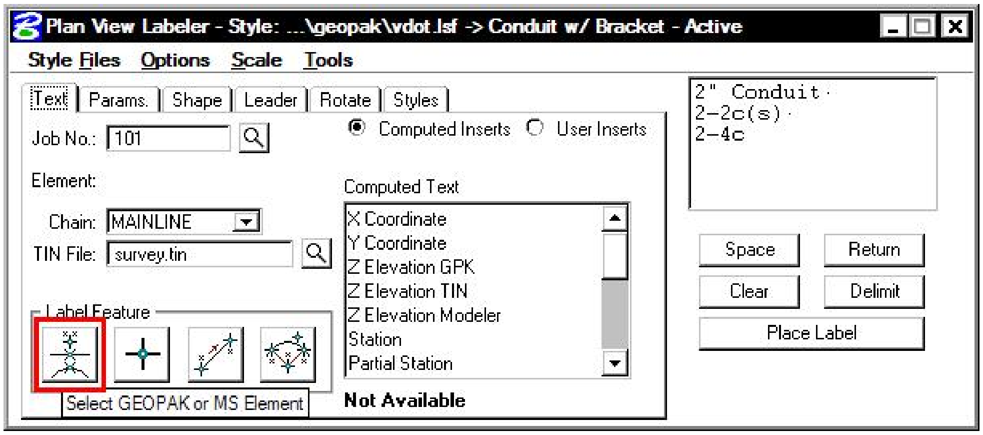
● Computed Inserts ○ User Inserts

Chain: MAINLINE

TIN File: survey.tin

2" Conduit
2-2c(s)
2-4c

Step 11. Click the **Select GEOPAK or MS Element** button and then identify the conduit labeled **CONDUIT 1**.


Plan View Labeler - Style: ...\geopak\vdot.lsf -> Conduit w/ Bracket - Active
Style Files
Options
Scale
Tools
Text
Params.
Shape
Leader
Rotate
Styles
Element:
Computed Text
X Coordinate
Y Coordinate
Z Elevation GPK
Z Elevation TIN
Z Elevation Modeler
Station
Partial Station
Label Feature
Select GEOPAK or MS Element
Not Available
Space
Return
Clear
Delimit
Place Label

Job No.: 101

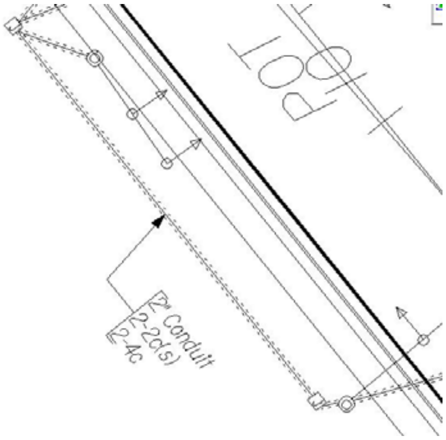
● Computed Inserts ○ User Inserts

Chain: MAINLINE

TIN File: survey.tin

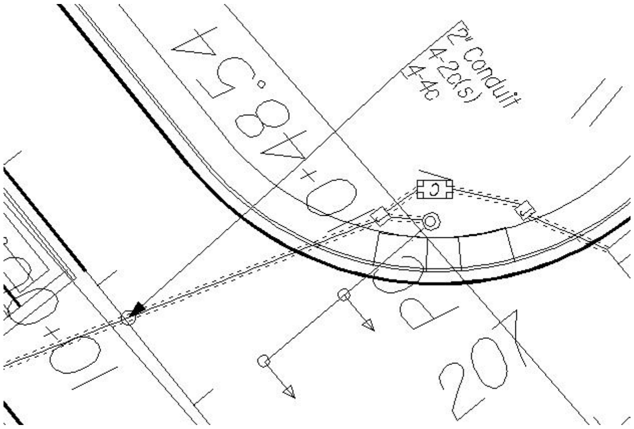
2" Conduit
2-2c(s)
2-4c

Step 12. The label will be attached to your cursor. Place the label at a location of you choice. It should look similar to the example below.

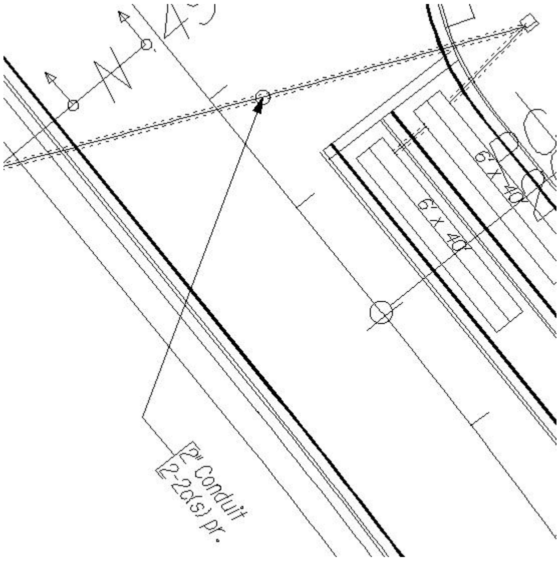

100
P
2" Conduit
2-2c(s)
2-4c

Step 13. Label **CONDUIT 2, CONDUIT 3,** and **CONDUIT 4** using the previous steps. An example of how the labels might appear is shown below.

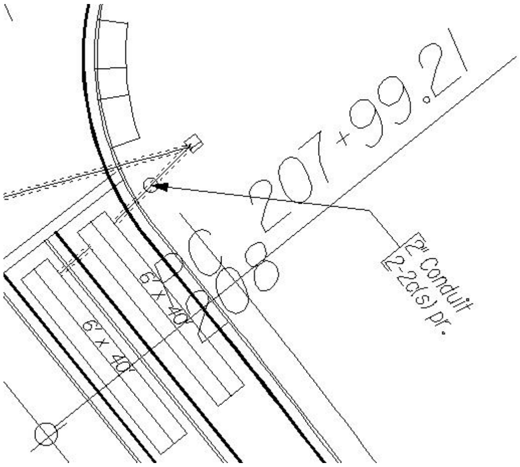
CONDUIT 2


2" Conduit
4-2c(s)
4-4c
C
207

CONDUIT 3


6' x 40'
6' x 40'
2" Conduit
2-2c(s) pr.

CONDUIT 4

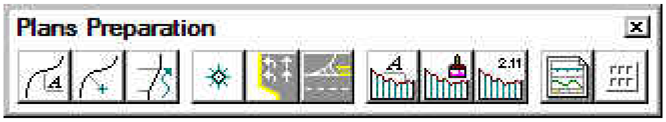

207+99.21
CC
208
2" Conduit
2-2c(s) pr.
6' x 40'
6' x 40'

Step 14. **Exit** MicroStation.

CHAPTER 7

Plan and Profile Sheets (Traffic Only)

7.1 Overview of Features

Feature / Function	Drawing of plan or plan / profile sheets.
Tool	
Project Manager (Road)	Plan and Profile Sheets
Menu Application	GEOPAK Road > Plans Preparation > Plan and Profile Sheets

The main feature of the 2001 Plus application is a simplified user interface, compared to the Classic application. In this way, users can quickly and easily generate a variety of plan, plan / profile and tabular data sheets.

In order to maintain compatibility with the Classic application and ease the transition for those users who want to utilize the 2001 Plus application, 2001 Plus supports importing .dat files utilized in the Classic application, and converting them to the new Port-oriented format. Dat files were the equivalent of the Sheet Library in the Classic application.

2001 Plus supports any combination of Ports on a sheet for maximum flexibility.

2001 Plus provides powerful handling of MicroStation reference files. This is accomplished by having other MicroStation files serve as patterns for the reference file attachments. These are called motif files.

2001 Plus has the option to automatically make a notch in the clipping shape at layout time to make room on the sheet for a title block. This is done by putting the clipping shape pattern into the sheet cell.

Extended Stationing is used as a means to allow sheets to be placed partially off of an alignment or even completely off of the alignment.

2001 Plus has the ability to place sheets with a Right to Left Station progression, which is opposite of the standard used in roadway design. This was added for users doing rail design.

A thorough capability is provided to perform sheet numbering. Alphanumeric prefixes and suffixes as well as changing the start number of the sheets and rearranging the ordering are all supported in 2001 Plus.

2001 Plus supports Profile Stair Stepping. In situations with steep grades or narrow profile ports, sometimes the profile goes off the top or bottom of the port before it gets to the end of it. To handle this, users would put a break in the profile port and adjust the elevations to bring the coverage up or down to where it needs to be. Within 2001 Plus, GEOPAK automatically locates these breaks and plots the profile clipping shapes in accordance with that. This adjustment carries through, then, to the sheet design file.

Profile Gap Equalities -- If a Profile has been plotted with the Gap option turned on, the coverage of the sheet is now adjusted so that subsequent sheets remain aligned with the grid.

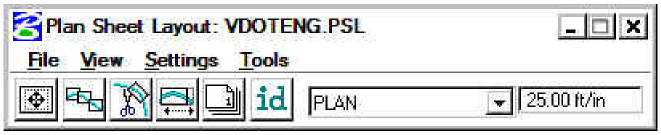
Raster Manager -- Descartes is not supported by the application. Raster Files are now to be referenced via the Raster Manager application available via Bentley Select.

Tabular Data Application -- Sheet Clip places Clipping Shapes suitable for Tabular Data. However, the actual placement of the tabular values in the dgn file is now done via the Draw Tabular Annotation (Sheet Clip Mode) tool. This approach allows the power and flexibility of the Draw Tabular Annotation application to be used with sheets.

Digital InterPlot – The Digital InterPlot Plot set can be created during the sheet clipping process.

7.2 Invoking The Main Dialog Box

When the GEOPAK User Preferences is set to 2001 Plus and Plan and Profile Sheet tool is selected, the GEOPAK Sheet Layout dialog box depicted below opens.

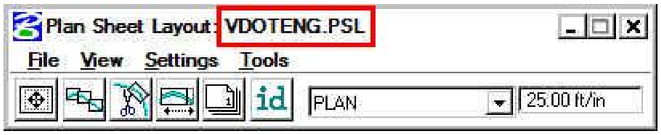


The dialog box is comprised of the title bar which displays the current Sheet Library, the main menu bar, short-cut icons, and the Sheet Name Selector and Plot Scale fields.

The first time the application is invoked, it opens up a default.psl sheet library located in the \geopak\bin\ folder if the configuration variable isn't defined.

The Plot Scale will be displayed in the proper units depending on how it is set in the User Preferences.

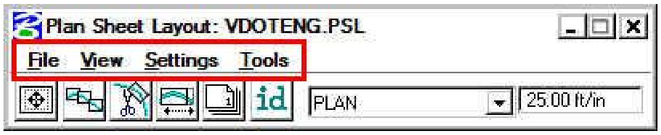
7.2.1 Sheet Library



The parameters for each sheet are defined in a Sheet Library. In order to lay out or clip sheets, a Sheet Library must be attached to the current session. The name of the currently attached Sheet Library is shown in the title bar. Sheet Libraries have an extension of psl. An unlimited number of different sheets can be stored within one library. When the user begins the sheet process, they select the desired sheet layout from the attached library, which loads the associated parameters.

If a different Sheet Library is needed, it can be attached via the menu items File > Sheet Library > Attach. It is also possible to review or make changes to the Sheet Library by selecting File > Sheet Library > Edit. Detailed information on the set-up of the Sheet Library can be found in the online help section entitled "Sheet Library Set-up."

7.2.2 Main Menu Bar Overview


Plan Sheet Layout: VDOTENG.PSL
File View Settings Tools
PLAN
25.00 ft/in

Four options are supported in the main menu bar:

- File
- View
- Settings
- Tools

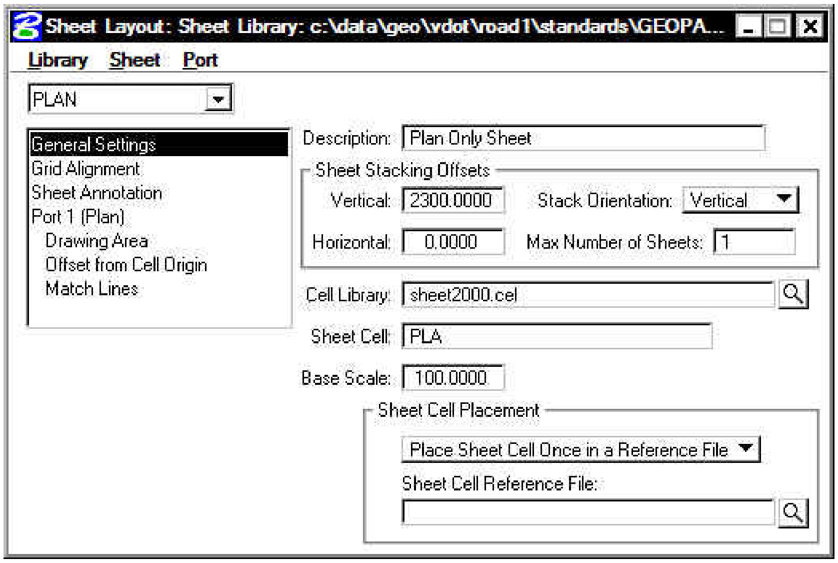
7.2.2.1 File Menu Options

Two tools are supported in the File pulldown and are detailed in the sub-sections below.

- Sheet Library
- Exit

7.2.2.1.1 Sheet Library

The Library file contains the various parameters, cells, and dimensions for creating sheets. In this menu option, a new Library can be created, an existing Library can be edited, or the user can define (Attach) the desired Library. For a detailed discussion of setting up and editing a Library, refer to the online documentation "Sheet Library Set-Up."


Sheet Layout: Sheet Library: c:\data\geo\vdot\road1\standards\GEOPA...
Library Sheet Port
General Settings
Grid Alignment
Sheet Annotation
Port 1 (Plan)
Drawing Area
Offset from Cell Origin
Match Lines
Sheet Stacking Offsets
Sheet Cell Placement

PLAN

Description: Plan Only Sheet

Vertical: 2300.0000

Stack Orientation: Vertical

Horizontal: 0.0000

Max Number of Sheets: 1

Cell Library: sheet2000.cel

Sheet Cell: PLA

Base Scale: 100.0000

Place Sheet Cell Once in a Reference File

Sheet Cell Reference File:

7.2.2.1.2 Exit

Exits the Plan and Profile Sheets application, but does not close the MicroStation file.

7.2.2.2 View Menu Options

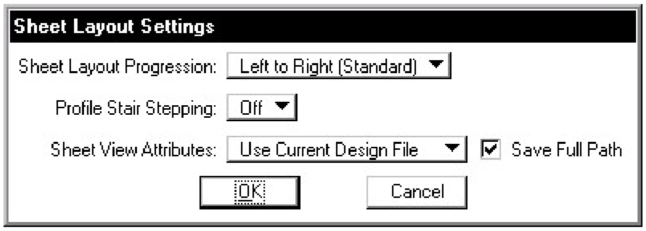
Three tools are supported in the View pulldown and are detailed in the table below.

Filter by Sheet Name	The clipping shapes of the currently selected sheet name are displayed. A MicroStation update view will need to be issued if "Automatic Update" is not toggled on.
Filter by Scale	The clipping shapes of the currently selected Scale are displayed. A MicroStation update view will need to be issued if "Automatic Update" is not toggled on. NOTE: "Filter By Sheet Name" and "Filter By Scale" can be used together.
Automatic Update	If this is toggled on when "Filter By Sheet Name" or "Filter By Scale" is selected the view is automatically updated.

7.2.2.3 Settings Menu Options

One tool is supported in the Settings pulldown and is detailed in the table below.

Settings Sheet Layout	When the Sheet Layout tool is selected, the dialog box depicted below opens. Three settings are supported within the dialog box including Left to Right or Right to Left layout, Stair Stepping for profiles, and sheet view attributes.



Sheet Layout Progression: Left to Right (Standard)
Profile Stair Stepping: Off
Sheet View Attributes: Use Current Design File
☑ Save Full Path

- Sheet Layout Progression:
    Left To Right (Standard)
    Right To Left (Rail)
- Profile Stair Stepping:
    Off
    On
- Sheet View Attributes:
    Use Current Design File
    Customize With Motif File

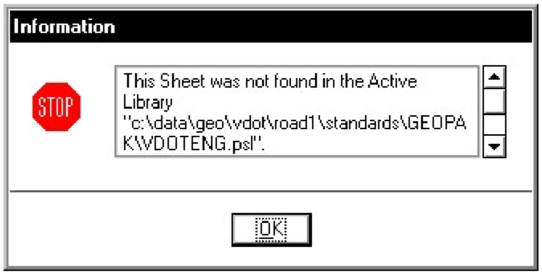
7.2.2.4 Tools Options

Eight tools are supported in the Tools pulldown and are detailed in the sub-sections below.

- Identify Sheet
- Sheet Composition
- Sheet Layout
- Sheet Clip
- Sheet Modify
- Sheet Number Manager
- Draw Tabular Annotation (Sheet Clip Mode)
- Processing Classic Plan & Profile Runs **(Not covered in this manual**)

7.2.2.4.1 Identify Sheet

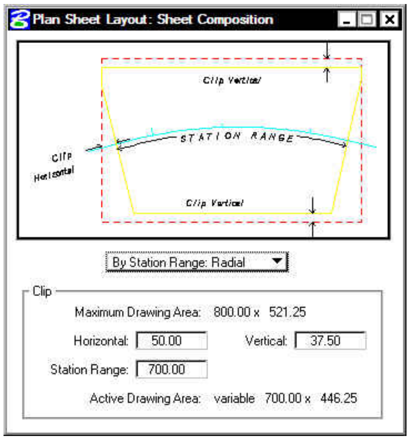
Select Identify Sheet, then select and accept a previously placed clipping shape. GEOPAK determines the settings utilized to place the original sheet and automatically populates the dialog box with the Sheet Name and Scale. In addition, the Sheet Name, Scale, Sheet Number and Port are displayed in the MicroStation prompt field at the bottom of the screen. If the parameters for the selected sheet are not found within the current library, a warning message is displayed indicating the sheet is not found, the name of the current library, and the name of the library used to place the original sheet.



This Sheet was not found in the Active Library "c:\data\geo\vdot\road1\standards\GEOPAK\VDOTENG.psl".

7.2.2.4.2 Sheet Composition

This menu item opens the Sheet Composition dialog box, wherein drawing area, overlapping options and other project specific variables are defined. One sample dialog box is depicted below.



By Station Range: Radial

Maximum Drawing Area: 800.00 x 521.25

Horizontal: 50.00

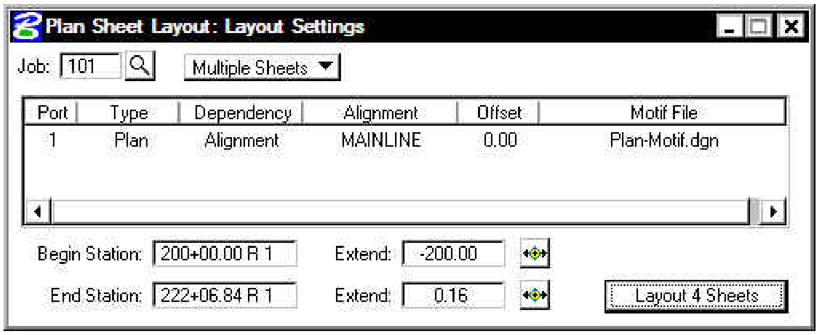
Vertical: 37.50

Station Range: 700.00

Active Drawing Area: variable 700.00 x 446.25

7.2.2.4.3 Sheet Layout

The Layout dialog box is utilized to define the GEOPAK Job Number, alignments, and / or profiles for the desired sheets.



Plan Sheet Layout: Layout Settings

Job: 101

Multiple Sheets

Port	Type	Dependency	Alignment	Offset	Motif File
1	Plan	Alignment	MAINLINE	0.00	Plan-Motif.dgn

Begin Station: 200+00.00 R 1

Extend: -200.00

End Station: 222+06.84 R 1

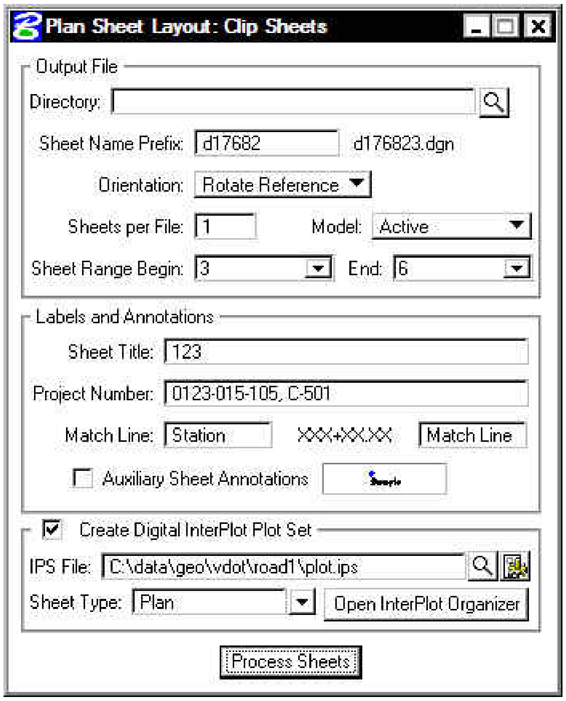
Extend: 0.16

Fields are also supported for stationing, if only part of the chain is being utilized for sheet layout.

7.2.2.4.4 Sheet Clip

Once the sheets have been laid out and any modifications complete, the sheets are ready to be clipped and drawn for the final production sheets. The Clip dialog box is utilized to complete these tasks, as detailed below.

Create Digital InterPlot Plot Set – Allows the creation of the Digital InterPlot Plot Set during the Layout Sheets process.



Plan Sheet Layout: Clip Sheets

Output File

Directory:

Sheet Name Prefix: d17682 d176823.dgn

Orientation: Rotate Reference

Sheets per File: 1

Model: Active

Sheet Range Begin: 3

End: 6

Labels and Annotations

Sheet Title: 123

Project Number: 0123-015-105, C-501

Match Line: Station XXX+XX.XX Match Line

☐ Auxiliary Sheet Annotations

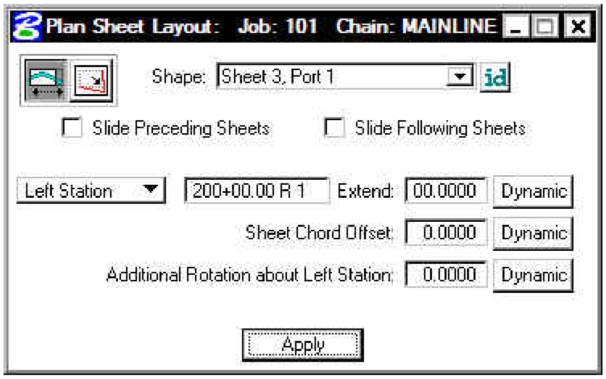
☑ Create Digital InterPlot Plot Set

IPS File: C:\data\geo\vdot\road1\plot.ips

Sheet Type: Plan

7.2.2.4.5 Sheet Modify

After the sheets are laid out, the user may want to adjust individual sheets to conform to the project limits, etc. This can be accomplished utilizing the tools in the Modify dialog box, which is illustrated below.



Plan Sheet Layout: Job: 101 Chain: MAINLINE

Shape: Sheet 3, Port 1

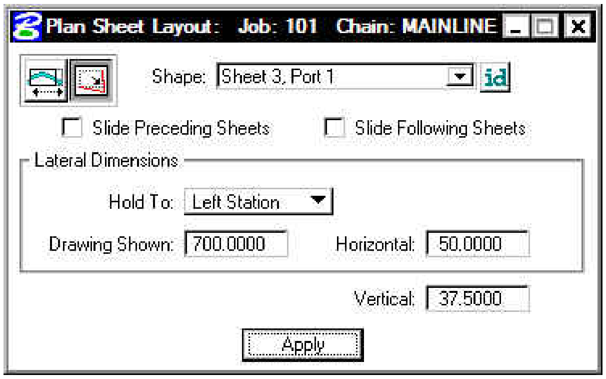
☐ Slide Preceding Sheets ☐ Slide Following Sheets

Left Station: 200+00.00 R 1 Extend: 00.0000

Sheet Chord Offset: 0.0000

Additional Rotation about Left Station: 0.0000

The two icons in the upper left corner are utilized to Slide sheets (along the alignment, rotating, offsetting) and Modify Drawing Area. The Slide options are illustrated above, while the graphic below depicts the Modifying Drawing area.



Plan Sheet Layout: Job: 101 Chain: MAINLINE

Shape: Sheet 3, Port 1

☐ Slide Preceding Sheets ☐ Slide Following Sheets

Lateral Dimensions

Hold To: Left Station

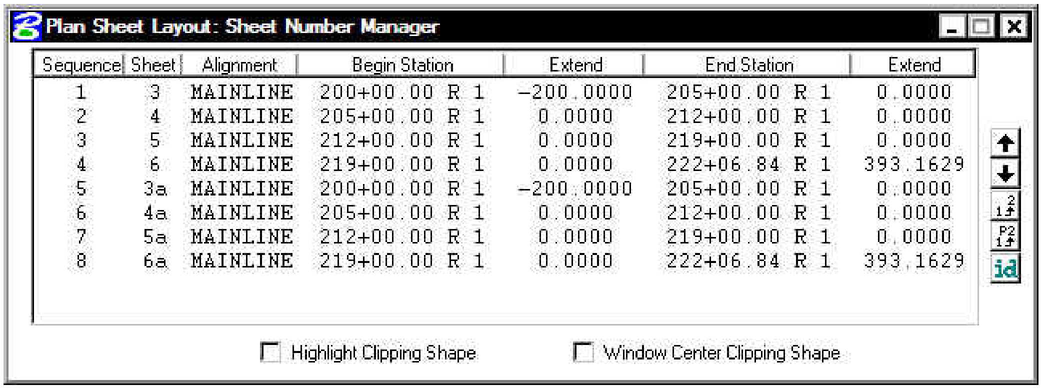
Drawing Shown: 700.0000 Horizontal: 50.0000

Vertical: 37.5000

The user can select the sheet to be modified from the pick list or by graphic identification. Sheets can also follow the movement of the selected sheet, i.e., moving one sheet to left moves all proceeding or following sheets to the left by the same amount.

7.2.2.4.6 Sheet Number Manager

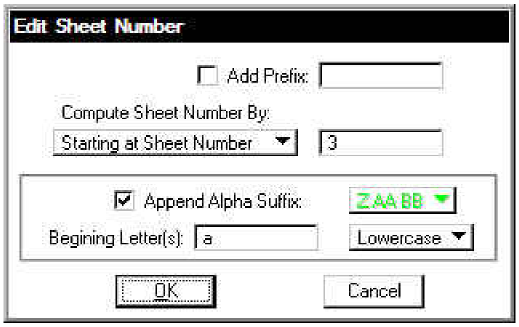
After the sheets are laid out, the Sheet Number Manager can be invoked as depicted below, populated with the current sheets.



Sequence	Sheet	Alignment	Begin Station	Extend	End Station	Extend
1	3	MAINLINE	200+00.00 R 1	-200.0000	205+00.00 R 1	0.0000
2	4	MAINLINE	205+00.00 R 1	0.0000	212+00.00 R 1	0.0000
3	5	MAINLINE	212+00.00 R 1	0.0000	219+00.00 R 1	0.0000
4	6	MAINLINE	219+00.00 R 1	0.0000	222+06.84 R 1	393.1629
5	3a	MAINLINE	200+00.00 R 1	-200.0000	205+00.00 R 1	0.0000
6	4a	MAINLINE	205+00.00 R 1	0.0000	212+00.00 R 1	0.0000
7	5a	MAINLINE	212+00.00 R 1	0.0000	219+00.00 R 1	0.0000
8	6a	MAINLINE	219+00.00 R 1	0.0000	222+06.84 R 1	393.1629

☐ Highlight Clipping Shape ☐ Window Center Clipping Shape

The actual sheet number can be modified, prefix and suffix added, and other labeling options by utilizing the Edit Sheet Number (fourth icon down in the grouping to the right of the list box).



☐ Add Prefix:

Compute Sheet Number By: Starting at Sheet Number 3

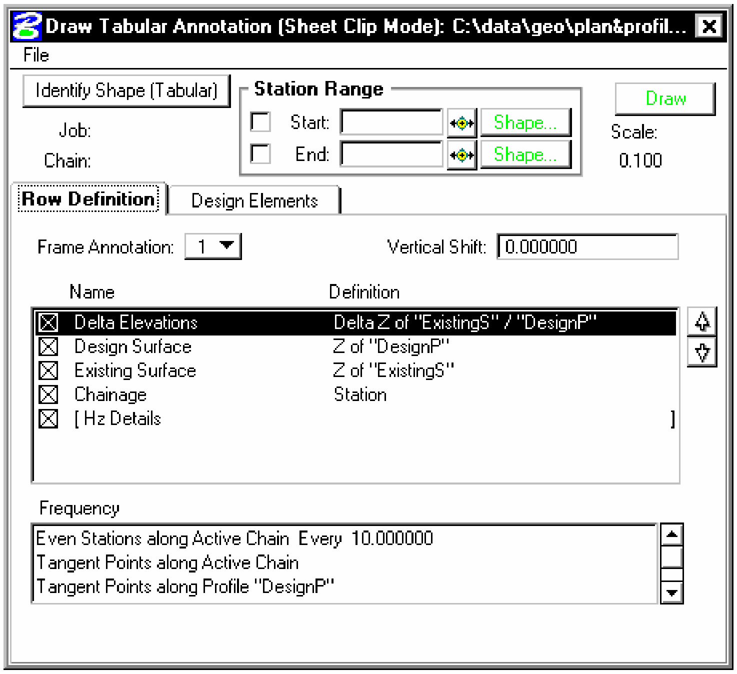
☑ Append Alpha Suffix: Z AA BB

Begining Letter(s): a Lowercase

Another option is changing the order the sheets are drawn.

7.2.2.4.7 Draw Tabular Annotation (Sheet Clip Mode)

When the Draw Tabular Annotation tool is selected, the Draw Tabular Annotation dialog box is opened, as depicted below.


Draw Tabular Annotation (Sheet Clip Mode): C:\data\geo\plan&profil...
File
Identify Shape (Tabular)
Station Range
Draw
Shape...
Shape...
Row Definition
Design Elements
Name
Definition
Frequency

Job:

Chain:

☐ Start:

☐ End:

Scale: 0.100

Frame Annotation: 1

Vertical Shift: 0.000000

Name	Definition
☒ Delta Elevations	Delta Z of "ExistingS" / "DesignP"
☒ Design Surface	Z of "DesignP"
☒ Existing Surface	Z of "ExistingS"
☒ Chainage	Station
☒ [Hz Details	]

Even Stations along Active Chain Every 10.000000
Tangent Points along Active Chain
Tangent Points along Profile "DesignP"

The user can define the tabular data to be included within the plan /profile sheets.

7.2.3 Dialog Box Icons

Six short-cut icons are supported for ease of use. These icons correspond to tools located within the menu bar pulldowns and are detailed in the table below.

Sheet Composition (Sheet > Composition).

Layout Sheets (Sheet > Layout).

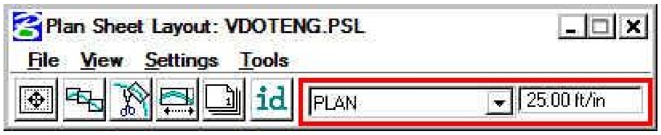
Clip Sheets (Sheet > Clip).

Modify Sheets (Tools > Modify).

Sheet Number Manager (Tools > Sheet Number Manager).

ID button (Tools > Identify Sheet).

7.2.4 Sheet Name Selector and Plot Scale



PLAN

25.00 ft/in

Two parameters are global to the entire application and are shown on the main dialog box:

- The **Sheet Name Selector** enables the user to select which sheet is to be placed in the next Layout operation. The drop down list displays all sheets in the currently attached Sheet Library.
- The **Plot Scale** text item determines the scale at which sheets will be placed in the layout.dgn.

7.3 Primary Work Flow

The approach taken by this application is to represent the reference-clipping boundary of each Port on each Sheet. The clipping boundary is represented by MicroStation Shapes, referred to as Clipping Shapes.

For each project, there is one design file which contains all of the Clipping Shapes for a project, for example, layout.dgn. All design elements exist in files referenced to layout.dgn. It is recommended that layout.dgn have only Clipping Shapes in it.

The Primary Work Flow consists of two operations:

- Layout of sheets – places clipping shapes into layout.dgn file.
- Clipping sheets - reads the Clipping Shapes from the Layout dgn and creates new design files which include all required reference files which are clipped at the correct boundaries along with the Sheet Cell and other annotations.

There are two options for Clipping Sheets: Rotate View and Rotate Reference.

When Sheets are clipped using the Rotate View option, the sheet cell and the view are moved and rotated such that they are coordinately correct with the clipping shape of Port One. This arrangement allows only one sheet per design file.

When Sheets are clipped using the Rotate Reference option, the sheet cell and view are not rotated. The reference files are rotated and moved to be in the correct location with respect to the sheet cell. The arrangement allows multiple sheets to be placed in one design file.

7.4 Ports

Each Sheet consists of one or more Ports. A Port can be considered a window into the design. For each sheet that is placed into a layout.dgn, each Port on that sheet is placed as a Clipping Shape.

7.4.1 Port Types

There are three types of Ports: Plan, Profile, and Tabular Data. It should be noted the 2001 plus version of Plan and Profile Sheet Composition does not place tabular data values. The application places Clipping Shapes designed to include Tabular Data. The actual placement of the Tabular Data values is accomplished by the Draw Tabular Annotation (Sheet Clip Mode) tool in coordination with the Plan and Profile Sheet Composition application.

7.4.2 Port Information

Before laying out sheets, each Port must have its Port Information filled out. The Port Information Dialog boxes are opened by double-clicking the corresponding row in the Layout Dialog box.

Plan Ports only need the controlling chain, an offset value, and the name of the motif file for the given Port. If the "Use Current Design File" option is selected, Current will be displayed in the dialog box instead of a Motif File name.

Motif files are used to determine reference file attachment.

Profile Ports require the name of the controlling profile in addition to all the information found in a profile cell.

Tabular Data Ports require the same kind of information that Profile Ports do, but also may optionally have the ability to stagger the placement of the ports. This staggering allows the Clipping Shapes to be longer without conflicting so that they may accommodate margin labels.

7.5 Sheet View Attributes

Two options are supported for **Sheet View Attributes**:

Use Current Design File – All reference file attachments, active levels, etc., are based on the current design file. An optional toggle is supported to **Save the Full Path** of reference files. **This toggle is only for the design file that contains the clipping shapes.**

Customize with Motif Files - A blank file is utilized as a pattern file for the reference file attachments. Also levels can be turned on or off as desired. We call these files motif files.

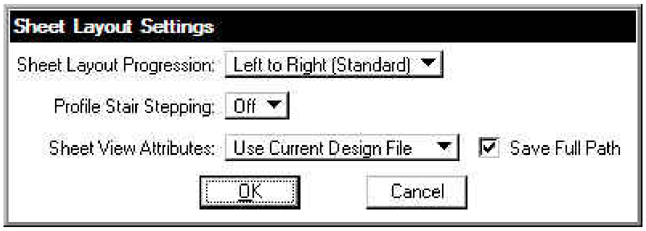
7.5.1 Use Current Design File

The user can control reference file attachment without the use of Motif Files by selecting the Use Current option for Sheet View Attributes. When this option is used, the Current dgn file (in which clipping shapes have been layed out) is used like a Motif file in that it's reference file attachment information carries over to each Port during Clipping.

Also the design file containing the clipping shapes will be attached as a reference file for each port to accommodate users that wish to place there clipping shapes in the proposed design file.

The advantage of Use Current Design File is that the user does not need to concern themselves with setting up motif files. What they see in the layout design file is what they will get in clipped sheet files. However, when Use Current Design File is that selected option, **it is not possible to have different reference file settings for different Ports on the same sheet**. All Ports must have the same attachment information and can't be customized.

The Save Full Path toggle is used for the Current Design File only when the sheets will be placed in a different directory than the reference files.



Sheet Layout Progression: Left to Right (Standard)
Profile Stair Stepping: Off
Sheet View Attributes: Use Current Design File
☑ Save Full Path

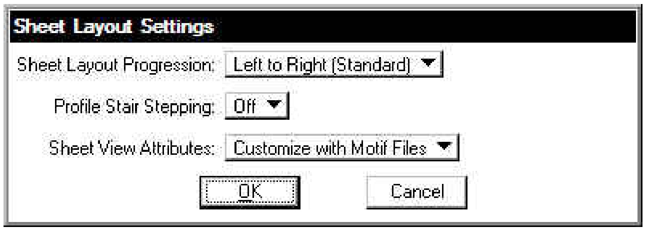
7.5.2 Customize With Motif Files

It is sometimes necessary to have two or more Ports on a sheet which have differing reference file attachment settings. This could happen with two Plan Ports which cover the same area but show different aspects of the project. For example, the top Port would show the proposed design and the bottom Port would show traffic control. This could be considered as the two Ports on the same sheet having different themes or different motifs.

The question arises as to how the various reference file settings are to be controlled for each Port. This is done by using another design file to serve as a pattern for the reference file attachment information. For every Port, there would be a motif file specified by its file name. The Ports on each sheet may have the same or different Motif Files.

During a Clip operation, the reference file attachment information is read from the motif file for each Port. When a Port is placed into the final sheet file, all reference files which are attached to the corresponding Motif File are attached to the final sheet design file. All reference level view on/off settings of the motif file are also applied to the reference file attachment in the final sheet design file. Note the clipping shapes are still used to define the Clip Boundary of each reference file associated with that Port.

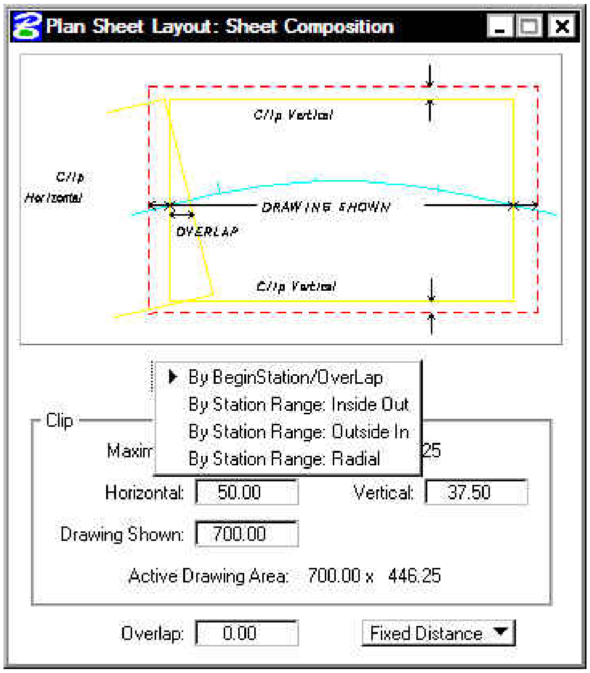
In the example described above of a sheet with Design and Traffic Control, the top Port could have a Motif File named design_motif.dgn. The bottom Port could have a Motif File named Traffic_motif.dgn. At any time before sheets are clipped, the Motif Files (which would normally be blank) must be opened, desired levels should be active, and the reference files attached. The reference file names and their paths used for the motif file must match exactly to the reference files and associated paths in the original file. Therefore, the user will normally set up the motif files on a project by project basis, unless an organization has a standardized set of file naming conventions and level structure utilized on every project, where a single set can be developed for the entire organization.



Sheet Layout Progression: Left to Right (Standard)
Profile Stair Stepping: Off
Sheet View Attributes: Customize with Motif Files

7.6 Sheet Composition

When the Sheet Composition tool is accessed, the dialog box depicted below opens.


Plan Sheet Layout: Sheet Composition
Clip Vertical
Clip Horizontal
DRAWING SHOWN
OVERLAP
Clip Vertical
By BeginStation/OverLap
By Station Range: Inside Out
By Station Range: Outside In
By Station Range: Radial
Clip

Maxim… 25

Horizontal: 50.00 Vertical: 37.50

Drawing Shown: 700.00

Active Drawing Area: 700.00 x 446.25

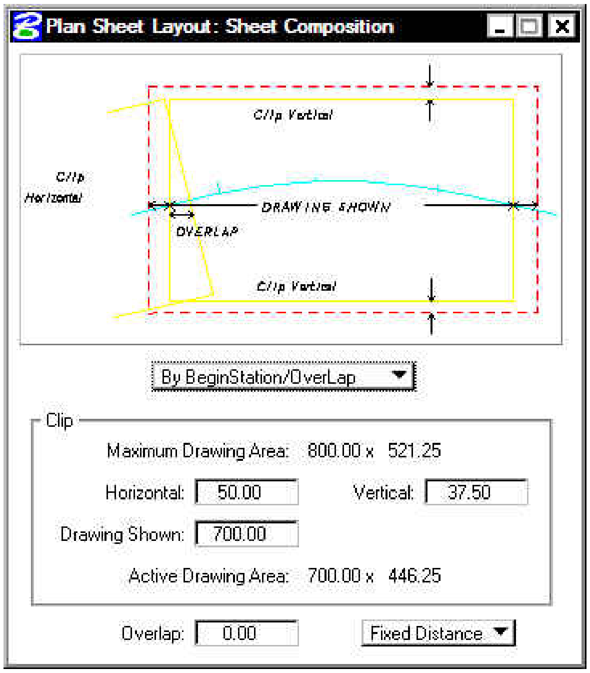
Overlap: 0.00 Fixed Distance

The graphic illustrates the various values required in the dialog box. Directly below, four options are supported, as illustrated in the exploded view above:

- **By Begin Station/Overlap**
- **By Station Range: Inside Out**
- **By Station Range: Outside In**
- **By Station Range: Radial**

7.6.1 By Begin Station/Overlap Option

When the **By Begin Station/Overlap** option is selected, the Clip group box containing the Drawing parameters, **Overlap** options and associated fields as depicted in the graphic below:


Plan Sheet Layout: Sheet Composition
Clip Vertical
Clip Horizontal
DRAWING SHOWN
OVERLAP
Clip Vertical

By BeginStation/OverLap

Clip

Maximum Drawing Area: 800.00 x 521.25

Horizontal: 50.00

Vertical: 37.50

Drawing Shown: 700.00

Active Drawing Area: 700.00 x 446.25

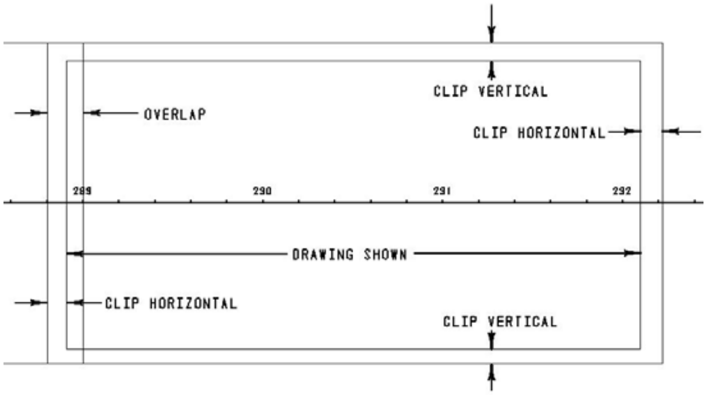
Overlap: 0.00

Fixed Distance

Before these options are reviewed, a discussion of the **Active Drawing Area**, located within the **Clip** group box, is warranted. Several dimensions are found within the **Clip** group box. These include:

- Maximum Drawing Area (display only)
- Horizontal
- Drawing Shown
- Vertical
- Active Drawing Area (display only, calculated by GEOPAK)

The graphic below illustrates each dimension for the subject sheet. In addition, a portion of the adjoining sheet to the left is shown in order to depict the overlap. Notice that the alignment is also displayed from approximately station 289+00 to 292+00.


OVERLAP
CLIP VERTICAL
CLIP HORIZONTAL
289
290
291
292
DRAWING SHOWN
CLIP HORIZONTAL
CLIP VERTICAL

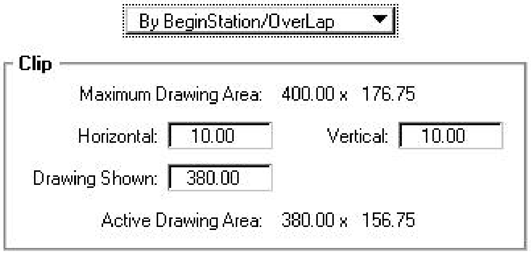
First, GEOPAK utilizes the Maximum Drawing Area based on the Sheet Name and Scale selected in the main Sheet Layout dialog box, in our example, 400.00 x 176.75. Then the Clip **Vertical** is subtracted twice, once for the top and once for the bottom. In this case,

176.75 - 10 - 10 = 156.75

which is shown in the **Active Drawing Area**. The same method is utilized for the Horizontal computations. The horizontal clip is subtracted twice, once for the right side and once for the left side. In this case,

400.00 - 10 - 10 = 380.00

which is shown in the **Drawing Shown** and the **Active Drawing Area.**



By BeginStation/OverLap

Clip

Maximum Drawing Area: 400.00 x 176.75

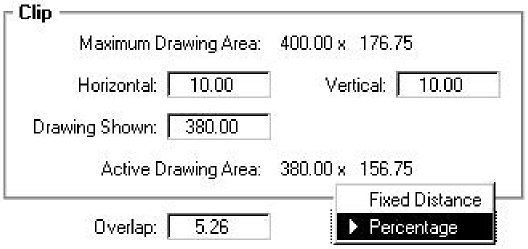
Horizontal: 10.00

Vertical: 10.00

Drawing Shown: 380.00

Active Drawing Area: 380.00 x 156.75

Once again referring to the graphic above, GEOPAK considers the Overlap shown on the left side between the two adjoining sheets. The **Overlap** toggle has two options as depicted in the exploded view below:



Clip

Maximum Drawing Area: 400.00 x 176.75

Horizontal: 10.00

Vertical: 10.00

Drawing Shown: 380.00

Active Drawing Area: 380.00 x 156.75

Overlap: 5.26

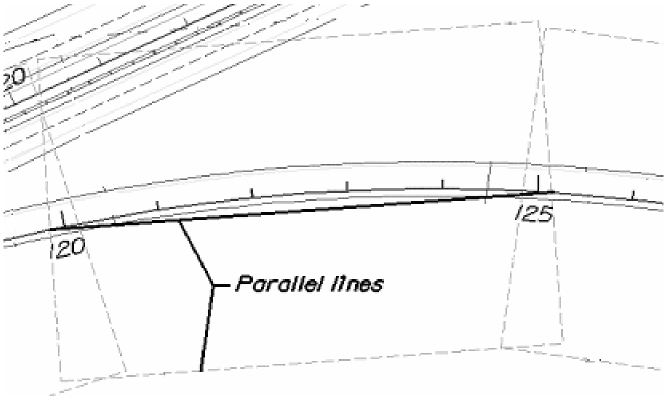
- Percentage
- Fixed Distance

When the **Percent** option is selected, the designer keys in the desired overlap in percent format in the **Overlap** field. Note the percent sign (%) is not required. The Percentage is calculated utilizing the Drawing Shown value. In this example, the 5.26% overlap is 156.75 feet (5.26% of 176.75).

In our Percentage example, the overlap is 5.26%. Therefore, a 20.00 foot overlap in clip areas is present between successive sheets.

If the **Fixed Distance** option is utilized, the Value field is in master units, i.e. feet or meters.

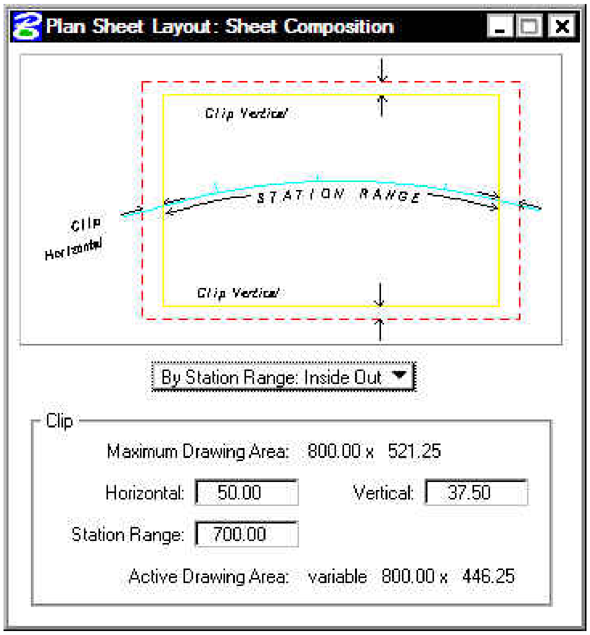
When placing sheets on a curve, the chord of the curve where it intersects the inside border is utilized to orient the sheet as depicted in the graphic below:


120
125
120
Parallel lines

Since the **By Begin Station/Overlap** Sheet Composition option uses a chord distance to compute the length of the sheet, in the area of a curve more stationing will be covered. On a Plan/Profile sheet, this means there will be unequal coverage between the Plan and Profile. With this in mind, it is recommended that **By Begin Station/Overlap** Sheet Composition option be used for a Plan only case.

7.6.2 By Station Range Inside Out Option

The **By Station Range: Inside Out** option orients sheets between a rounded station interval. This interval is entered in the **Station Range** field. When utilizing this option, the Clip group box also has a slightly different look as seen in the graphic depicted below.


Plan Sheet Layout: Sheet Composition
Clip Vertical
STATION RANGE
Clip Horizontal
Clip Vertical
By Station Range: Inside Out
Clip

Maximum Drawing Area: 800.00 x 521.25

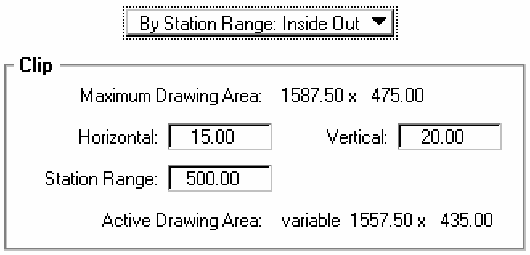
Horizontal: 50.00 Vertical: 37.50

Station Range: 700.00

Active Drawing Area: variable 800.00 x 446.25

Now the **Active Drawing Area** is not constant, but displays **Variable** in the output field.

The **Horizontal** keyin has a slightly different meaning which can be best illustrated with an example. Let's use 500 feet for the **Station Range**, and 15 feet **Horizontal**. The dialog box is depicted below.


By Station Range: Inside Out

Clip

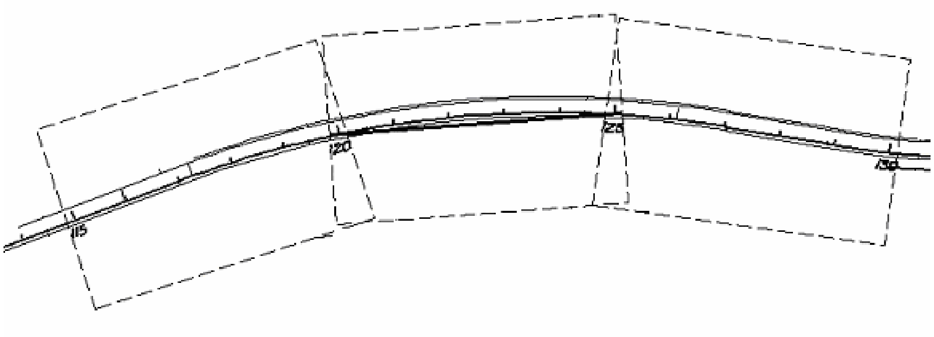
Maximum Drawing Area: 1587.50 x 475.00

Horizontal: 15.00 Vertical: 20.00

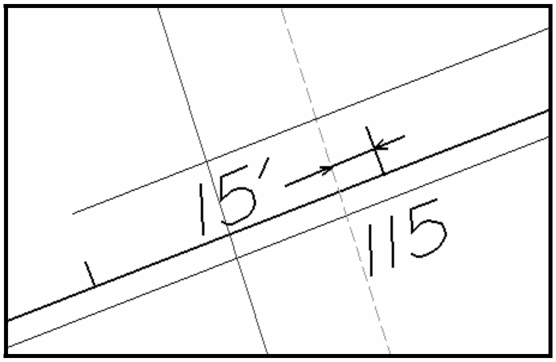
Station Range: 500.00

Active Drawing Area: variable 1557.50 x 435.00

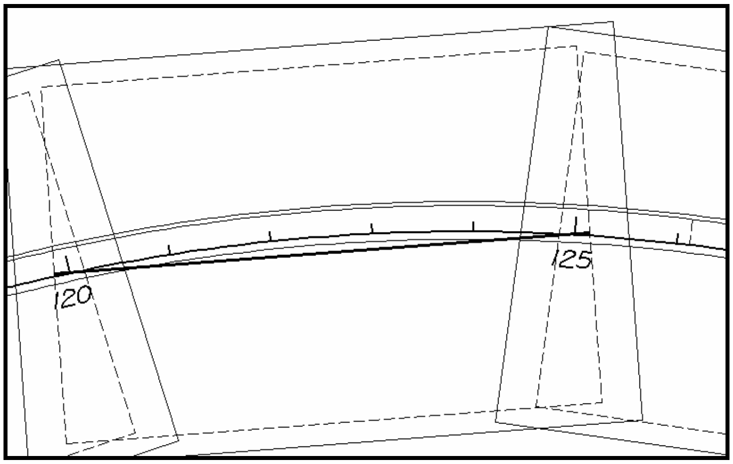
Utilizing the dialog box above, the following sheets are generated.



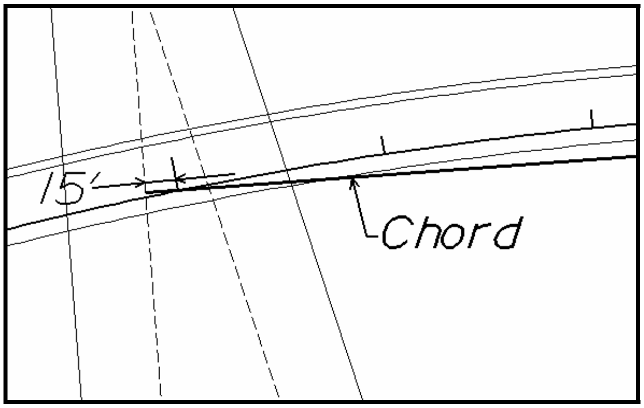
The first step when the sheets are drawn is to determine the stationing for each sheet. Our first sheet will be oriented between stations 115+00 to 120+00. GEOPAK then expands the sheet clip area by the **Horizontal** keyin distance. Looking at a detail of the beginning of the project, the clip area is expanded fifteen feet before station 115+00 as seen in the graphic below. Note the inside border is the dashed line, and station 115+00 and its associated tick mark are shown.



The curve is calculated slightly different. The second sheet in this series is on a curve. The station range is 120+00 to 125+00. A chord is drawn for the curve between stations 120+00 and 125+00 as seen in the graphic below.

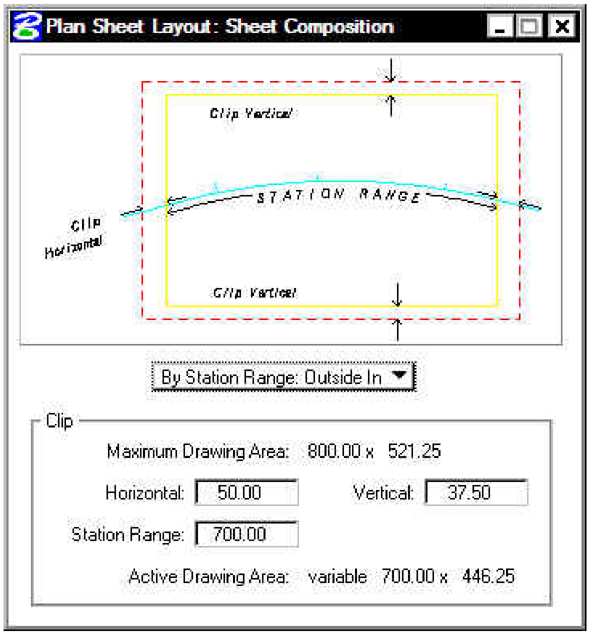


Notice that the inside sheet border is wider than the chord. The software will extend the chord the amount of the Horizontal keyin (in our example, fifteen feet) to establish the vertical edge of the inside border as seen in the detail below.



7.6.3 By Station Range Outside In Option

The **By Station Range: Outside In** option orients sheets between a rounded station interval. This interval is entered in the **Station Range** field. When utilizing this option, the Clip group box also has a slightly different look as seen in the graphic depicted below.



By Station Range: Outside In

Clip

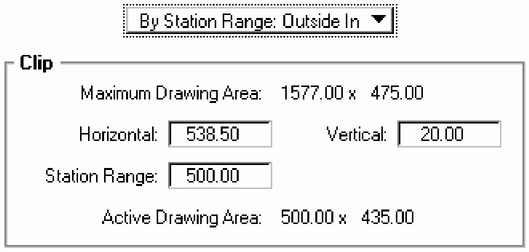
Maximum Drawing Area: 800.00 x 521.25

Horizontal: 50.00 Vertical: 37.50

Station Range: 700.00

Active Drawing Area: variable 700.00 x 446.25

The **Outside In** option is slightly different as seen in the dialog box below.



By Station Range: Outside In

Clip

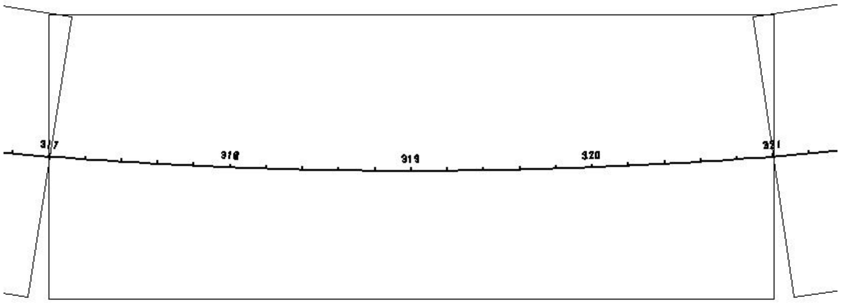
Maximum Drawing Area: 1577.00 x 475.00

Horizontal: 538.50 Vertical: 20.00

Station Range: 500.00

Active Drawing Area: 500.00 x 435.00

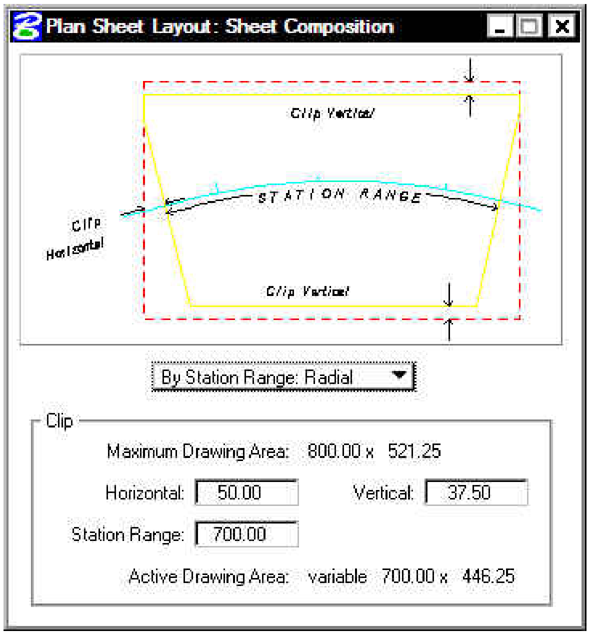
The Clip Area is no longer variable, but a constant based on the **Sheet Size** as well as the **Horizontal** and **Vertical** fields. In our example, the same 500 feet is keyed in. When generating the sheets, GEOPAK determines the center of the sheet, and the corresponding station. In our example the midpoint of the stationing for the sheet from 120+00 to 125+00 is 122+50. This point will be placed at the midpoint of the sheet as depicted in the drawing below:


317
318
319
320
321

Since the clip area covers a constant station range, the length of the clipping shape will vary depending on the curvature of the alignment.

7.6.4 By Station Radial Option

The **By Station Range: Radial** option orients sheets between a rounded station interval. This interval is entered in the **Station Range** field.


Plan Sheet Layout: Sheet Composition
Clip Vertical
STATION RANGE
Clip Horizontal
Clip Vertical

By Station Range: Radial

Clip

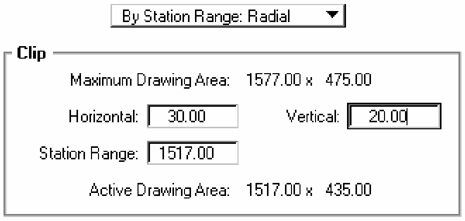
Maximum Drawing Area: 800.00 x 521.25

Horizontal: 50.00 Vertical: 37.50

Station Range: 700.00

Active Drawing Area: variable 700.00 x 446.25

An example best describes how this feature works. In the dialog box below, each sheet has a station range of 500 feet. Based on the station ranges in the bottom of the dialog box, the first sheet would encompass station 120+00 to 125+00, while the second sheet would include stations 125+00 to 130+00.



By Station Range: Radial

Clip

Maximum Drawing Area: 1577.00 x 475.00

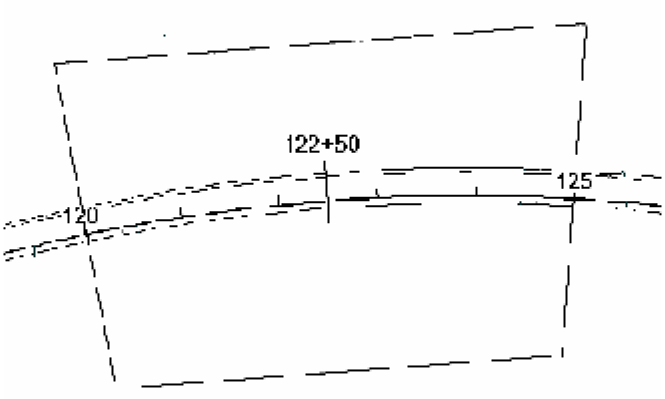
Horizontal: 30.00 Vertical: 20.00

Station Range: 1517.00

Active Drawing Area: 1517.00 x 435.00

To draw this second sheet, GEOPAK locates the midpoint station 122+50, which in our example is on a curve. Utilizing the chord of curve as the vertical center, GEOPAK draws the top and bottom of the clip regions 217.5 feet from the chord, making the clip region 435 feet high. This is computed from the sheet size of 475 minus the vertical keyin of 20 for the top and 20 for the bottom, resulting in a 435 feet height.

In the next step, GEOPAK moves to station 125+00 and draws the clip border radial to the alignment at the specified station until it intersects with the previously computed top and bottom clip regions. The same process is repeated at the other end of the sheet, i.e., 130+00. Therefore, the inside clip region is trapezoidal as depicted in the graphic below.



Since the clip area covers a constant station range, the length of the clipping shape will vary depending on the curvature of the alignment.

LAB 7: Plan Only Sheets

7.1 Getting Started

Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB7.EXE**.

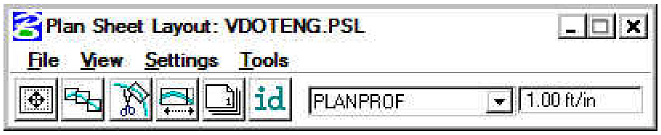
Step 2. Open the Microstation file **c:\data\geo\VDOT\PlansPrep\d17682work.dgn.**

Access **Project Manager**.

7.2 Plan Sheet Layout Process

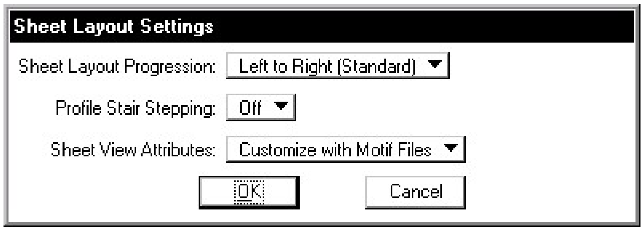
Step 1. Click the **Plan & Profile Sheets** button from the **Road Project: 17682.prj** workflow dialog box.

Step 2. Create a run named **Plan** to set up the plan sheets. Initially, the dialog box will appear similar to the one shown below.


Plan Sheet Layout: VDOTENG.PSL
File View Settings Tools
id

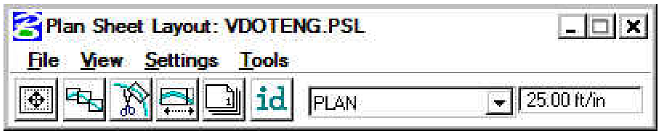
PLANPROF
1.00 ft/in

Step 3. Select **Settings>Sheet Layout**. Change **"Sheet View Attributes"** option to **Customize with Motif Files** then click **OK**. The completed dialog box is shown below.


Sheet Layout Settings
OK
Cancel

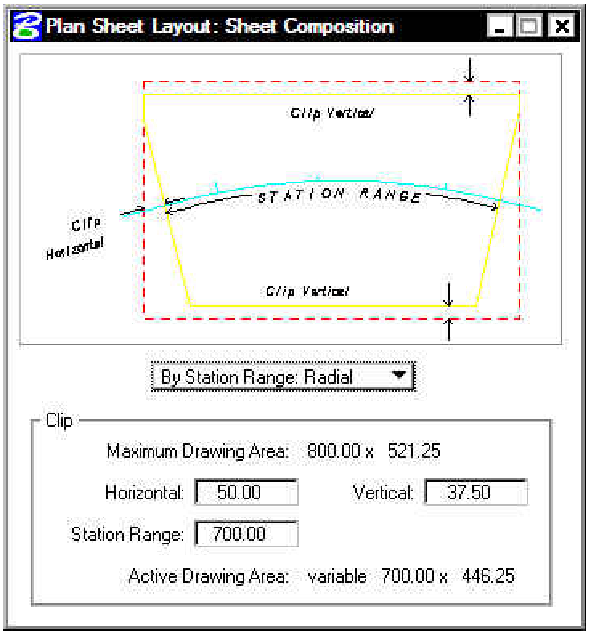
Sheet Layout Progression: Left to Right (Standard)
Profile Stair Stepping: Off
Sheet View Attributes: Customize with Motif Files

Step 4. On the **GEOPAK Sheet Layout** dialog box, select **PLAN** from the sheet list then set the scale to **25.00 ft/in**. The **GEOPAK Sheet Layout** dialog box should appear as below.


Plan Sheet Layout: VDOTENG.PSL
File View Settings Tools
id

PLAN
25.00 ft/in

Step 5. Press the **Sheet Composition** icon. Populate the **Sheet Composition** dialog box as below.


Plan Sheet Layout: Sheet Composition
Clip Vertical
STATION RANGE
Clip Horizontal
Clip Vertical
Clip

By Station Range: Radial

Maximum Drawing Area: 800.00 x 521.25

Horizontal: 50.00

Vertical: 37.50

Station Range: 700.00

Active Drawing Area: variable 700.00 x 446.25

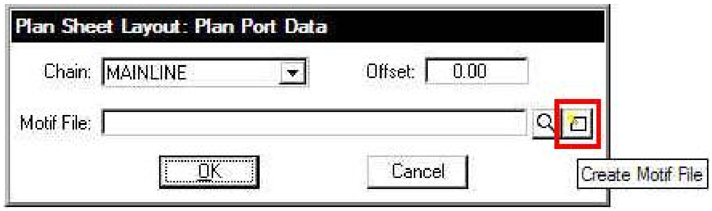
Note: The Vertical setting will trim off the top and bottom of the clipping shape so that plan data will not be placed inside the title blocks on the sheet.

Step 6. Dismiss the **Sheet Composition** dialog box by pressing the **X** in the upper right hand corner.

Step 7. Press the **Layout Sheets** icon. The **GEOPAK Job** number **101** should be set from Project Manager.

Step 8. Double click on **Port 1**. Set the **Chain** to **MAINLINE** by selecting it from the option list.

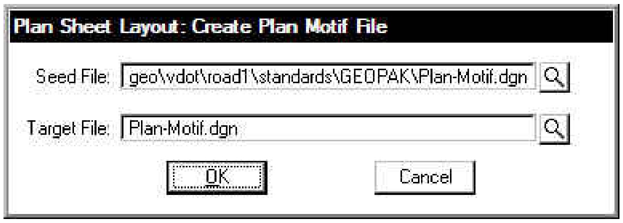
Step 9. Press the **Create Motif File** icon.


Plan Sheet Layout: Plan Port Data
Motif File:
OK
Cancel
Create Motif File

Chain: MAINLINE

Offset: 0.00

Step 10. Populate the **Create Plan Motif File** dialog box as below.

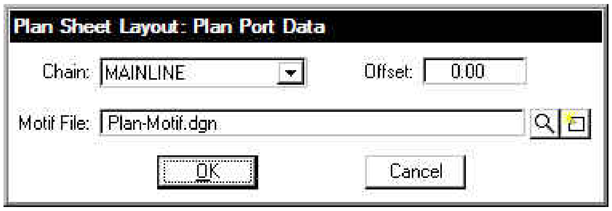

Plan Sheet Layout: Create Plan Motif File

Seed File: geo\vdot\road1\standards\GEOPAK\Plan-Motif.dgn

Target File: Plan-Motif.dgn

Note: The **Seed File** can be selected by pressing the **Select Seed Motif File** icon then selecting **Plan-Motif.dgn.** The **Target File** name should be entered manually.

Step 11. Press **OK** on the **Create Plan Motif File** dialog box**.** A file named **Plan-Motif.dgn** should be created in the working directory and the **Plan Port Data** dialog box should appear as below.

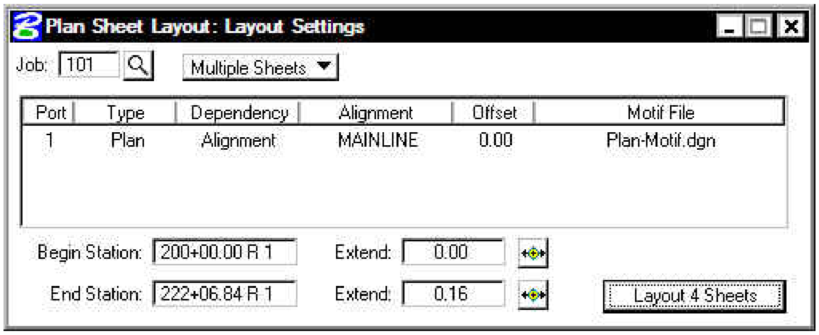

Plan Sheet Layout: Plan Port Data

Chain: MAINLINE

Offset: 0.00

Motif File: Plan-Motif.dgn

Step 12. Press **OK** on the **Plan Port Data** dialog box**.** The **Layout Sheets** dialog box should now appear as below.


Plan Sheet Layout: Layout Settings

Job: 101

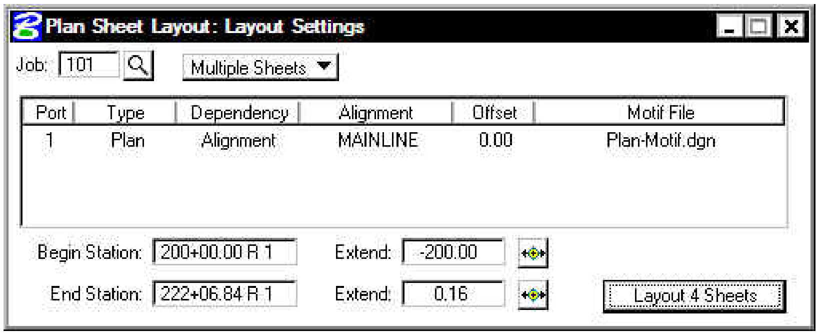
Multiple Sheets

Port	Type	Dependency	Alignment	Offset	Motif File
1	Plan	Alignment	MAINLINE	0.00	Plan-Motif.dgn

Begin Station: 200+00.00 R 1 Extend: 0.00

End Station: 222+06.84 R 1 Extend: 0.16

Step 13. In the **Layout Sheets** dialog box, set the **Extend** value for the **Begin Station** to **–200.00**. This will force the first sheet to end at **Station 205+00.00**. The dialog box should appear as below. Click the **Layout 4 Sheets** button to draw the clipping shapes into the design file.


Plan Sheet Layout: Layout Settings

Job: 101

Multiple Sheets

Port	Type	Dependency	Alignment	Offset	Motif File
1	Plan	Alignment	MAINLINE	0.00	Plan-Motif.dgn

Begin Station: 200+00.00 R 1 Extend: -200.00

End Station: 222+06.84 R 1 Extend: 0.16

4 clipping shapes should be placed for the **Plan** port.

Step 14. Dismiss the **Layout Sheets** dialog box by pressing the **X** in the upper right hand corner.

Step 15. Exit the Plan and Profile Sheet dialog box and save your run. Review the results.

7.3 Motif File Setup

In the following steps we will set up the **Motif Files** created in the previous section so that the **Plan** view file will be displayed in the **Plan Port**.

Step 1. Open **Plan-Motif.dgn**.

Step 2. Attach **d17682des.dgn** as a reference file. Do a **Fit View** and **Save Settings** if necessary.

Step 3. Open **d17682work.dgn**.

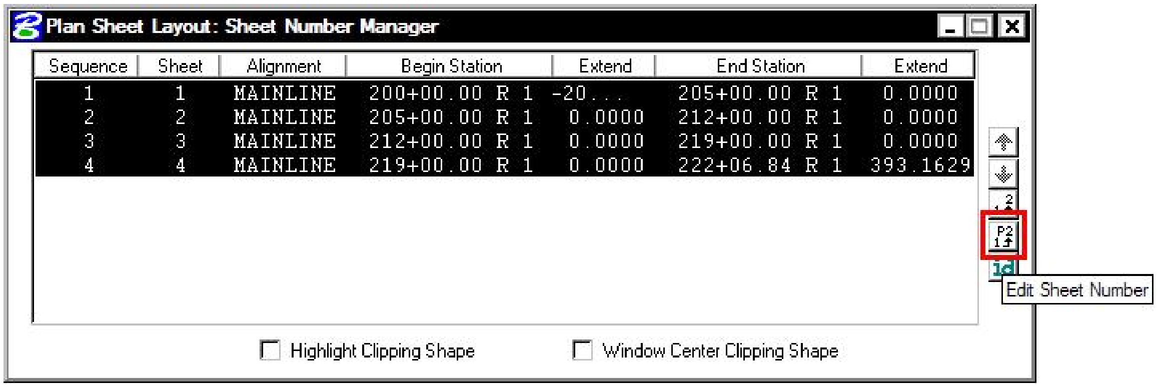
Note: Any design file that needs to be clipped to the sheets should be attached to the Motif Files (e.g. Survey, Utilities, Contours, etc.).

7.4 Renumber Sheets

Step 1. Click the **Plan & Profile Sheets** button from the **Road Project: 17682.prj** workflow dialog box. Access the **Plan** run.

Step 2. Press the **Sheet Number Manager** icon.

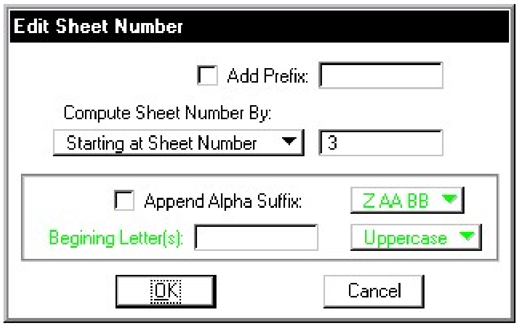
Step 3. Select Sequence Numbers **1 through 4** then press the **Edit Sheet Number** button.


Plan Sheet Layout: Sheet Number Manager

Sequence	Sheet	Alignment	Begin Station	Extend	End Station	Extend
1	1	MAINLINE	200+00.00 R 1	-20...	205+00.00 R 1	0.0000
2	2	MAINLINE	205+00.00 R 1	0.0000	212+00.00 R 1	0.0000
3	3	MAINLINE	212+00.00 R 1	0.0000	219+00.00 R 1	0.0000
4	4	MAINLINE	219+00.00 R 1	0.0000	222+06.84 R 1	393.1629

Edit Sheet Number
☐ Highlight Clipping Shape
☐ Window Center Clipping Shape

Step 4. Populate the **Edit Sheet Number** dialog box as below then push **OK**.



Edit Sheet Number

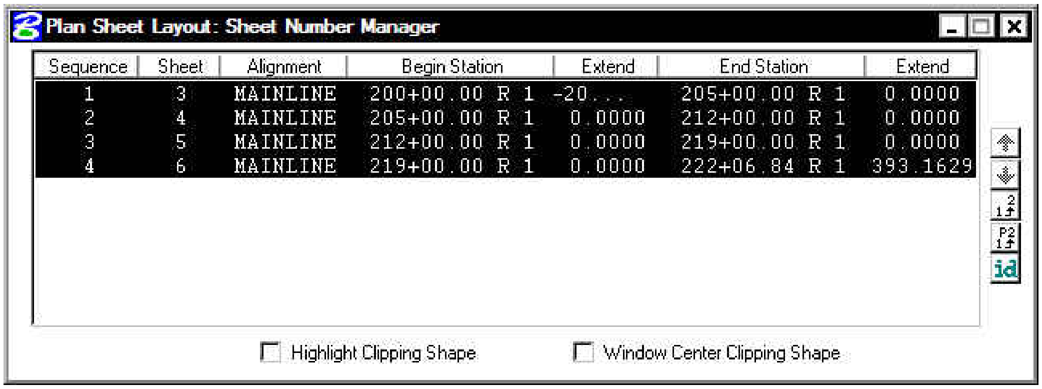
☐ Add Prefix:

Compute Sheet Number By: Starting at Sheet Number 3

☐ Append Alpha Suffix: Z AA BB

Begining Letter(s): Uppercase

The **Sheet Number Manager** dialog box should appear as below.



Plan Sheet Layout: Sheet Number Manager

Sequence	Sheet	Alignment	Begin Station	Extend	End Station	Extend
1	3	MAINLINE	200+00.00 R 1	-20...	205+00.00 R 1	0.0000
2	4	MAINLINE	205+00.00 R 1	0.0000	212+00.00 R 1	0.0000
3	5	MAINLINE	212+00.00 R 1	0.0000	219+00.00 R 1	0.0000
4	6	MAINLINE	219+00.00 R 1	0.0000	222+06.84 R 1	393.1629

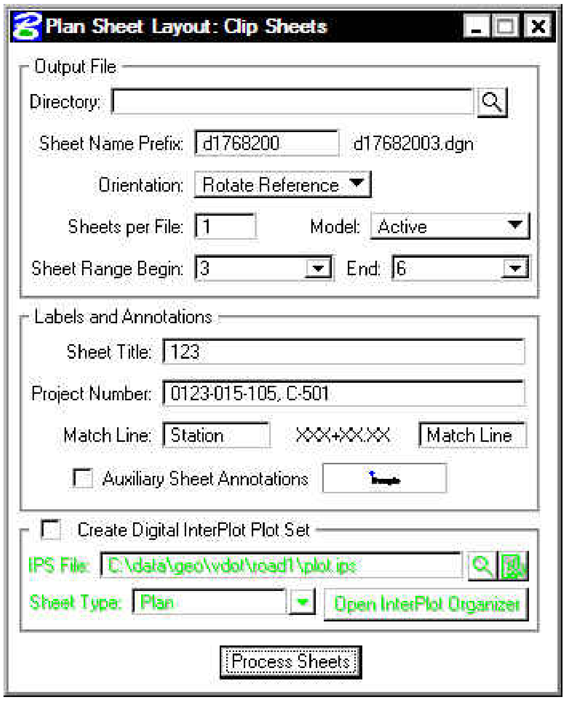
☐ Highlight Clipping Shape ☐ Window Center Clipping Shape

Step 5. Dismiss the **Sheet Number Manager** dialog box by pressing the **X** in the upper right hand corner. Press **Yes** when prompted to **Save Settings**.

7.5 Clip Plan Sheets

You should still be in the **Plan** run from the previous section.

Step 1. Press the **Clip Sheets** icon. Populate the **Clip Sheets** dialog box as below.



Plan Sheet Layout: Clip Sheets

Output File

Directory:

Sheet Name Prefix: d1768200 d17682003.dgn

Orientation: Rotate Reference

Sheets per File: 1 Model: Active

Sheet Range Begin: 3 End: 6

Labels and Annotations

Sheet Title: 123

Project Number: 0123-015-105, C-501

Match Line: Station XXX+XX.XX Match Line

☐ Auxiliary Sheet Annotations

☐ Create Digital InterPlot Plot Set

IPS File: C:\data\geo\vdot\road1\plot.ips

Sheet Type: Plan

Note: The **Sheet Title** field will be used to place the **Route Number**.

Step 2. Click the **Process Sheets** button to create the plan sheets.

Step 3. Dismiss the **Clip Sheets** dialog box by pressing the **X** in the upper right hand corner.

Step 4. **Exit** the Plan and Profile Sheet dialog box and save your run.

Step 5. Open any of the newly created **Plan Sheet** files to see the resulting sheets.

Step 6. **Exit** MicroStation.

CHAPTER 8

D&C Manager – Quantities (Traffic Only)

8.1 Introduction

Objectives	Understand the operational modes of the D&C Manager including calculating automated quantities.
Project Manager	Plan View Design
Tools	
Menu Bar Application	GEOPAK Road > Design and Computation Manager

The Design and Computation Manager (D&C Manager) is a tool that enables the user to standardize graphics elements for drafting and pay item quantities. To review how to access the Design and Computation manager, see session 5.

One of the major goals of any design project is the cost-effective development of plans production sheets. This includes construction plans, profile sheets, estimated quantities, and various other sheets needed to actually construct the design. Although generic MicroStation commands can be utilized to produce the required sheets, several GEOPAK tools can be used in conjunction with the Design and Computation Manager and these MicroStation commands to help automate the process.

Other GEOPAK tools are within the Design and Computation Manager and various plan view functions:

- Controlling Various MicroStation Copy Functions utilizing the Place Influence option and the Design mode
- Controlling the MicroStation Display Filters (Display mode)
- Changing the MicroStation symbology via GEOPAK Items (Set mode)
- Identification of plan view areas to incorporate into the automated quantities (Shape mode)
- Plan view quantities (Compute mode)
- Pavement Markings
- Pavement Symbols

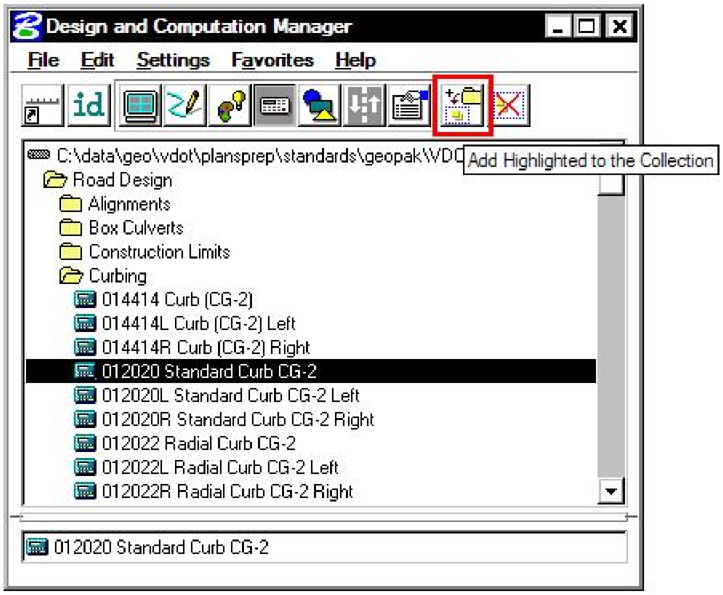
8.2 Operational Modes

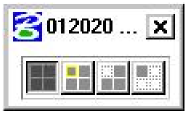
Several operational modes are supported within the Design and Computation Manager. The Design mode was discussed in session 5. In this session, the following modes are reviewed: display, set, shape, compute and pavement markings.

8.2.1 Display

Display mode is used to enhance on screen visualization by enabling the user to manipulate the display of GEOPAK intelligent elements.

The feature(s) to be visualized are added to the Collection box – the bottom window of the D&C Manager dialog box when set to Display or Compute modes. Individual items or entire categories can be placed in the collection by utilizing the **Add to Collection** icon as shown below.

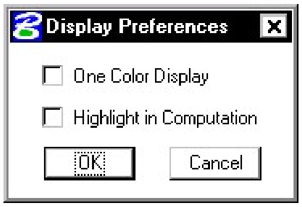

Design and Computation Manager
File
Edit
Settings
Favorites
Help
Add Highlighted to the Collection
C:\data\geo\vdot\plansprep\standards\geopak\VDC
Road Design
Alignments
Box Culverts
Construction Limits
Curbing
014414 Curb (CG-2)
014414L Curb (CG-2) Left
014414R Curb (CG-2) Right
012020 Standard Curb CG-2
012020L Standard Curb CG-2 Left
012020R Standard Curb CG-2 Right
012022 Radial Curb CG-2
012022L Radial Curb CG-2 Left
012022R Radial Curb CG-2 Right
012020 Standard Curb CG-2



Three display options are supported for the display of the items in the Collection box.

- **Highlight** - changes those items stored in the collection area to the MicroStation highlight color.
- **Not** - simply turns off the display of the collection items leaving everything else on.
- **Only** - will turn off everything but the collection items.

Before utilizing the display filters, visualization is enhanced if all the elements on the screen are gray, or another singular color, rather than the vast conglomeration of color seen on the screen for a typical project. Therefore, to set the color, select **Settings > Display** from the menu bar. The Display Preferences dialog box appears.


Display Preferences
OK
Cancel

☐ One Color Display
☐ Highlight in Computation

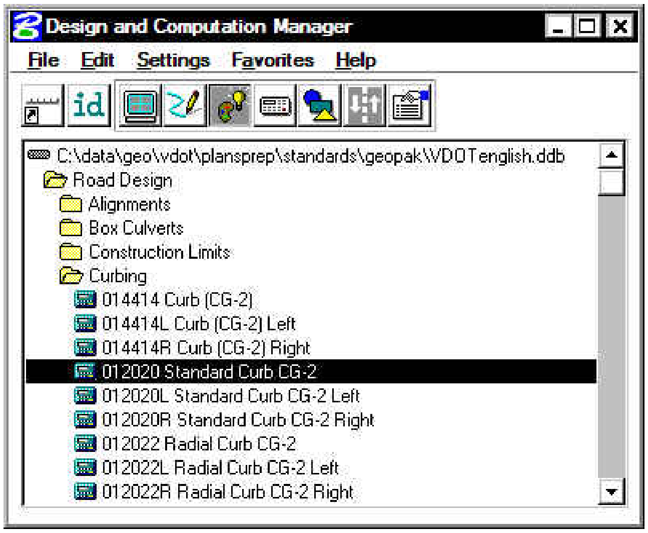
8.2.2 Set

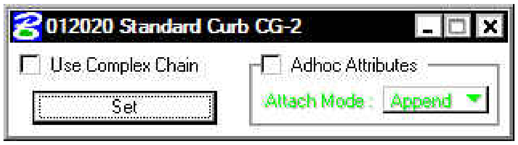
The Set mode allows the user to assign attributes from the ddb database to existing graphical elements in the file. Three methods are available for specifying the graphic elements to be changed: individual element selection, Complex Chain or MicroStation Selection Set.

When changing individual elements, highlight the desired item in the D&C Manager dialog box. Click Set, then datapoint the element to modify, then datapoint off the element to accept.

Complex Chain automatically creates a chain from graphic elements and applies the attributes of the highlighted item in the content box.

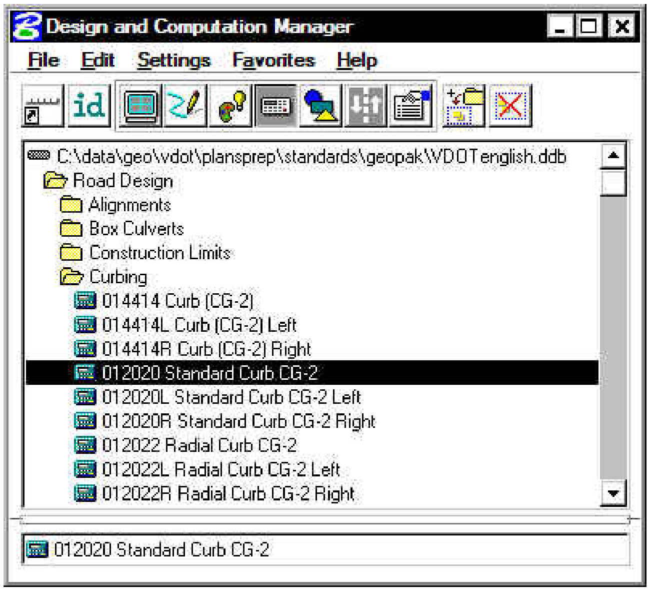
To modify the symbology of many elements to a single item, create a MicroStation Selection Set of the elements. Next, click **Set** to transfer the attributes of the item selected in the D&C Manager to the items identified in the MicroStation design file.

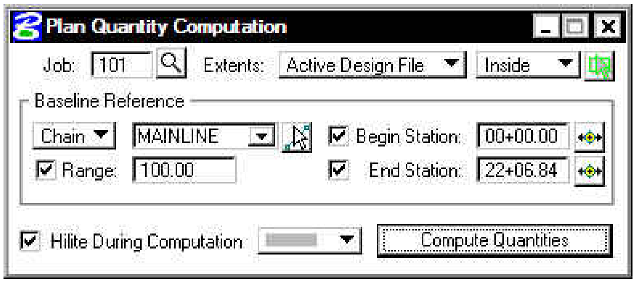

Design and Computation Manager
File Edit Settings Favorites Help
C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
Road Design
Alignments
Box Culverts
Construction Limits
Curbing
014414 Curb (CG-2)
014414L Curb (CG-2) Left
014414R Curb (CG-2) Right
012020 Standard Curb CG-2
012020L Standard Curb CG-2 Left
012020R Standard Curb CG-2 Right
012022 Radial Curb CG-2
012022L Radial Curb CG-2 Left
012022R Radial Curb CG-2 Right


012020 Standard Curb CG-2
☐ Use Complex Chain
☐ Adhoc Attributes
Set
Attach Mode : Append

8.2.3 Compute

An important, yet time-consuming part of any project is the computation of quantities. Through the Compute mode of the Design and Computation Manager, GEOPAK offers tools that make the completion of this task much quicker and easier. In addition, since the software utilizes the plan view construction drawings to compile quantities, discrepancies between the drawings and the tabulated quantities are non-existent. Chosen items within either the *View* or a *Fence* are calculated


Design and Computation Manager
File Edit Settings Favorites Help
C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
Road Design
Alignments
Box Culverts
Construction Limits
Curbing
014414 Curb (CG-2)
014414L Curb (CG-2) Left
014414R Curb (CG-2) Right
012020 Standard Curb CG-2
012020L Standard Curb CG-2 Left
012020R Standard Curb CG-2 Right
012022 Radial Curb CG-2
012022L Radial Curb CG-2 Left
012022R Radial Curb CG-2 Right
012020 Standard Curb CG-2



Job: 101
Extents: Active Design File
Inside
Chain
MAINLINE
☑ Begin Station: 00+00.00
☑ Range: 100.00
☑ End Station: 22+06.84
☑ Hilite During Computation

Once the MicroStation plan view design file is accessed, the first step is to invoke the Design and Computation Manager and click the shortcut button at the top of the dialog box to Compute.

The dialog box changes dynamically to reflect the compute operation.

The Design and Computation Manager dialog box is resizable. Within the dialog box, the sash (long, thin bar between list boxes) enables the user to adjust the partition between the list and collection boxes while the overall dialog box size remains constant. Simply place the cursor over the sash and dynamically move.

In addition to dynamically adjusting the main dialog box to reflect the compute operation, the auxiliary dialog box is invoked as depicted below. Note if the auxiliary dialog box was already invoked from another operation, it dynamically changes to reflect the Compute operation.

The next step is the selection of the correct item from the hierarchy. GEOPAK computes quantities only for those hierarchical items that are configured for the computation of quantities.

Two selection methods can be employed. The first method is to select an entire category. GEOPAK computes quantities for every item found in the selected category as well as any child categories. This is accomplished by double clicking through the groups until the desired category is contained in the Content list box. Single click onto the desired category and click the **Add to Collection** button at the top of the dialog box.

The second method involves the selection of individual features. This is accomplished by double clicking through the categories until the desired item appears in the hierarchy list box. When seen in the hierarchy list box, a single click onto the desired item and subsequent click of the **Add to Collection** button places the item in the Collection box.

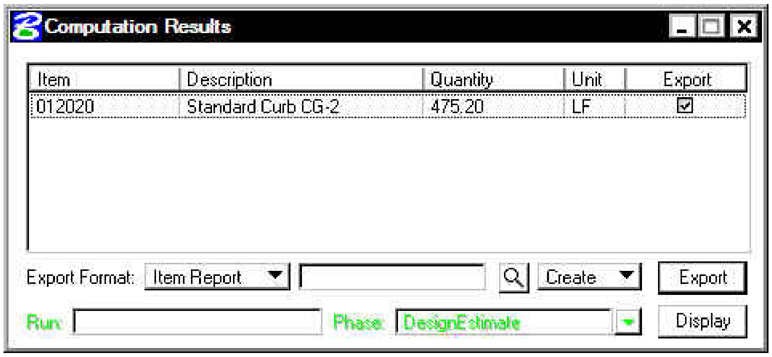
Several output formats are available as described in the table below.

NOTE: All **Extents** options are sensitive to the Inside, Overlap and Clip modes.

Job Number	GEOPAK Coordinate geometry database (GPK) file wherein the specified chain is stored.
Extents > Active Design File	If the Active Design File toggle is selected, all selected items that are in MicroStation file will be computed.
Extents > View	If the View toggle is selected, only selected items that can be seen in MicroStation view one will be computed. If the view includes area outside of the Range, the Range will override.
Extents > Fence	If the Fence toggle is selected, a fence must be placed, and all specified

	graphical features which are inside both the fence and the Range will be tabulated.
Extents > Boundary Element	If the Boundary Element toggle is selected, all selected items that are in a selected Boundary Element will be computed.
Extents > Station Range	If the Station Range toggle is selected, all selected items that are within a selected Station Range will be computed.
Extents > Sheet Range	If the Sheet Range toggle is selected, all selected items that are in a selected Plan Sheet Clip Boundary will be computed.
Extents > Selection Set	If the Selection Set toggle is selected, all selected items that are in a MicroStation Selection Set will be computed.
Extents > Boundary Selection Set	If the Boundary Selection Set toggle is selected, all selected items that are in a group of boundary elements within a MicroStation Selection Set will be computed.
Highlight During Computation	When activated, all MicroStation elements utilized in computations are highlighted in the selected color.
Baseline Reference > Chain	Requires a minimum of one chain which must be stored in the specified job number.
Baseline Reference > DGN	The user can graphically select a DGN Element to be used as a Baseline Reference.
Baseline Reference > None	When None is selected, nothing is used as a Baseline Reference.
Identify Chain	The Identify Chain Selector allows the user to graphically select the desired chain.
Range	Left and right offset limits (in master units) from the chain where the quantities will be computed. Any specified item located outside of the limits is not included in the report
Begin/End Station	Station range for computing quantities
Compute Quantities	Commences the computation process.

After the desired quantities have been computed, a second dialog box will be displayed containing the computed quantities. The dialog box is shown below.



Item	Description	Quantity	Unit	Export
012020	Standard Curb CG-2	475.20	LF	☑

Export Format: Item Report

Run:

Phase: DesignEstimate

Several output formats are available as described in the table below.

Comp Book	A more detailed report that lists not only quantity summaries, but also geometric properties such as plan view coordinates and station/offsets for located elements. File is in ASCII format.
Item Report	Quantities Summary listing pay items, descriptions, units and total quantities for located elements. File is in ASCII format.
Item Tables	Contains the same information as the Item Report, but formatted in tabular form.
DBMS	Very detailed information including calculated and rounded quantities, geometric properties, pay item numbers, descriptions, station / offset values, etc. The format is the selected database (i.e., Microsoft Access, Oracle, SQL Server, and dbase.
CSV By Item	Quantities Summary listing pay items, descriptions, units and total quantities for located elements. Format is in CSV format.
CSV By Element	A more detailed report that lists not only quantity summaries, but also geometric properties such as plan view coordinates and station/offsets for located elements. Format is in CSV format.

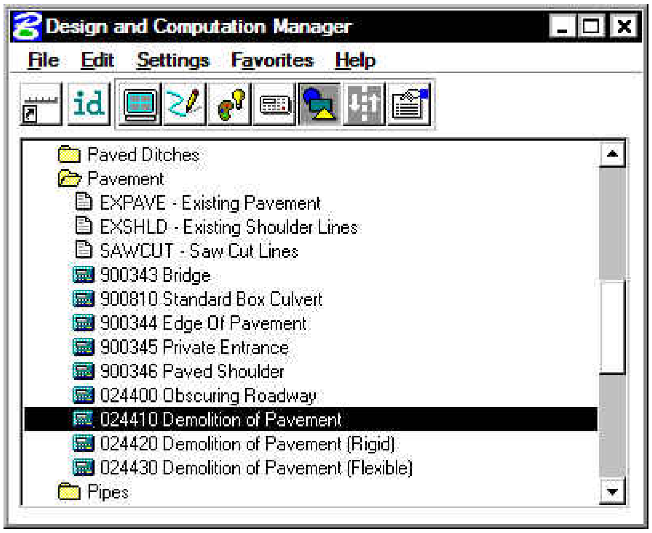
Run	A method of grouping various quantities and / or pay items.
Phase	Quantities can be separated into various phases, as a means to group various pay items. Default phases include: Design, Preliminary, and Final. Note the user can add new phases, but must be aware of naming limitations of downstream applications (i.e., Transport links in Quantities Manager.)

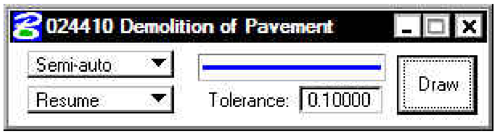
8.2.4 Shape

The placement of shapes for area quantities is simple and fast when utilizing the shape mode. In order to place a shape, GEOPAK must identify a closed area. This area can be defined by intersecting elements, which do not have to be clipped or shortened to define the closed area. There are three options for placing shapes depending on the complexity of the plan view and the type of area where quantities are desired:

- **Automatic** - best utilized when the elements forming the shape do not conflict with other elements in the view.
- **Semi-auto** - utilized when the plan view has more conflicting elements or where the selection of an area produces very small shapes. In this method, the user is prompted when each element is selected to determine the path of the software in producing shapes.
- **Exclusive** - This option utilizes the automatic option, but in addition, prompts the user for the identification of an area inside the original shape that is excluded from the area quantity. The Exclude mode is useful for curb and gutter around a traffic island.

Any of the three options may be chosen during the course of shape placement. To change from one option to another, simply adjust the option button on the left side of dialog box.


Design and Computation Manager
File
Edit
Settings
Favorites
Help
Paved Ditches
Pavement
EXPAVE - Existing Pavement
EXSHLD - Existing Shoulder Lines
SAWCUT - Saw Cut Lines
900343 Bridge
900810 Standard Box Culvert
900344 Edge Of Pavement
900345 Private Entrance
900346 Paved Shoulder
024400 Obscuring Roadway
024410 Demolition of Pavement
024420 Demolition of Pavement (Rigid)
024430 Demolition of Pavement (Flexible)
Pipes

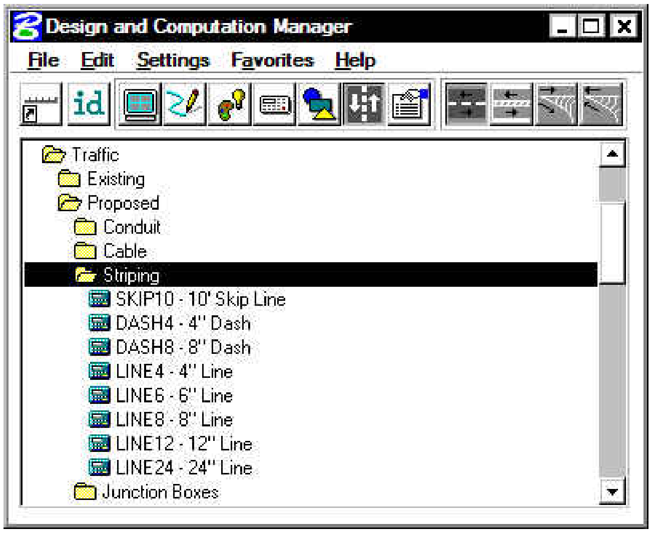

024410 Demolition of Pavement
Draw

Semi-auto

Resume

Tolerance: 0.10000

8.2.5 Pavement Marking



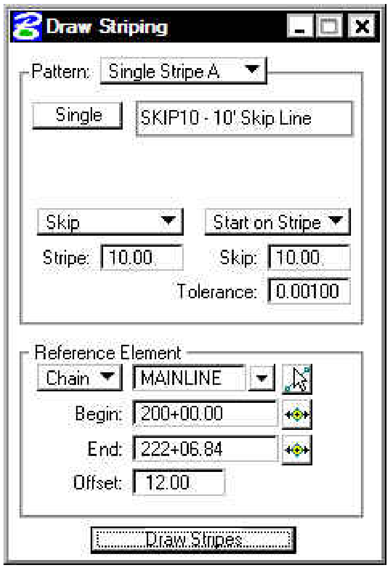
- Traffic
  - Existing
  - Proposed
    - Conduit
    - Cable
    - Striping
      - SKIP10 - 10' Skip Line
      - DASH4 - 4" Dash
      - DASH8 - 8" Dash
      - LINE4 - 4" Line
      - LINE6 - 6" Line
      - LINE8 - 8" Line
      - LINE12 - 12" Line
      - LINE24 - 24" Line
    - Junction Boxes

The **Pavement Marking** mode allows the user to place pavement marking including striping, and symbols.

The various tools are detailed in the table below.

Striping	Places single or double, solid or skip pavement stripes.
Separation	Places traffic separation pavement marking.
Chevron Diverge	Places pavement chevrons in areas of diverging traffic.
Chevron Merge	Places pavement chevrons in areas of merging traffic.

8.2.5.1 Single Striping



Pattern: Single Stripe A

Single: SKIP10 - 10' Skip Line

Skip

Start on Stripe

Stripe: 10.00

Skip: 10.00

Tolerance: 0.00100

Reference Element

Chain: MAINLINE

Begin: 200+00.00

End: 222+06.84

Offset: 12.00

This dialog box offers predefined configurations for single stripe and double stripe options to easily control the type of striping being placed.

The pay item reflects the currently selected pay item in the **D&C Manager** dialog box; however, it may be changed at any time during the process.

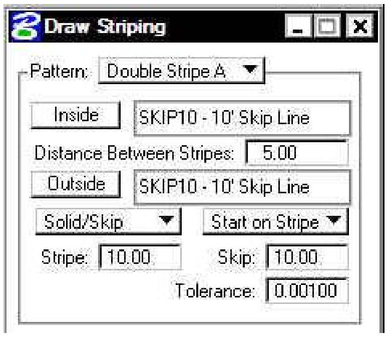
Next, define the start option by selecting **Solid** or **Skip** (or a combination thereof). If Skip is active, the user must define the stripe and skip lengths. If an ending stripe is shorter than the Tolerance value, it will not be drawn.

A beginning and ending point for the limits of striping are entered from digitized points on the screen.

The lower portion of the dialog box provides tools for identifying the reference element on which the striping will be based.

After clicking **Draw Stripes**, the user must enter a data point on either side of the reference element to begin striping. Striping is placed at the indicated offset value; the data point controls whether striping is offset left or right. *Striping is placed as a graphic group.*

8.2.5.2 Double Striping



Pattern: Double Stripe A

Inside: SKIP10 - 10' Skip Line

Distance Between Stripes: 5.00

Outside: SKIP10 - 10' Skip Line

Solid/Skip

Start on Stripe

Stripe: 10.00

Skip: 10.00

Tolerance: 0.00100

The process for Double Striping is the same as Single, except for having two pay item placement options, Inside and Outside and a user definable Distance Between Stripes. The user must select either the Inside or Outside button for the highlighted (D&C Manager) pay item to be displayed in the dialog box. Separate quantities are calculated for each stripe.

The remaining process is the same as described above.

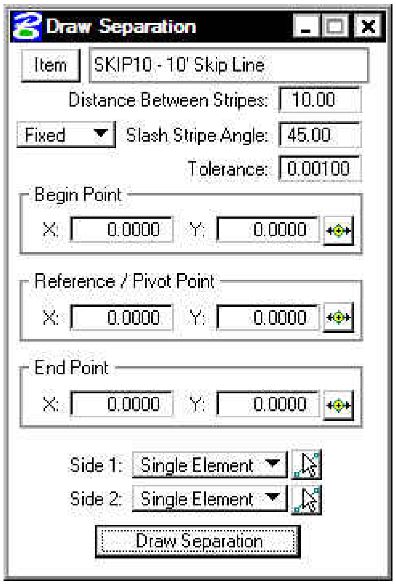
8.2.5.3 Separation

This option draws pavement markings between two sets of selected elements. Elements may be either GEOPAK or MicroStation generated.

Once a pay item has been selected, the user may set the **Distance Between Stripes** and the **Slash Stripe Angle**. Tolerance functions the same as for striping.

A **Begin DP** and **End DP** should be issued before the **Reference DP** is identified. The Reference DP must fall between the beginning and ending **DP**. It marks the location of the first pavement marking and determines the direction of the slashed stripe. All other markings will be based on the first stripe.

Tools for defining the limits of the pavement markings are located at the bottom of the Separation dialog box. **ID Intersection** identifies the elements where the striping will terminate. **ID Location** is the set of elements from which the striping begins.



Item: SKIP10 - 10' Skip Line
Distance Between Stripes: 10.00
Fixed
Slash Stripe Angle: 45.00
Tolerance: 0.00100
Begin Point X: 0.0000 Y: 0.0000
Reference / Pivot Point X: 0.0000 Y: 0.0000
End Point X: 0.0000 Y: 0.0000
Side 1: Single Element
Side 2: Single Element

After the **Draw Separation** button is selected, the user must issue a data point in the graphics file for the pavement markings to be displayed.

8.2.5.4 Chevron Diverge

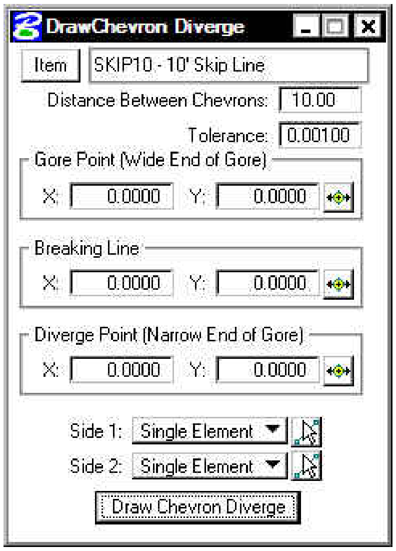
Once the pay item and its relative parameters have been defined, there are three points needed to define the chevron: **Gore, Breaking Line** and **Point.**

The **Gore** point defines the wide end of the gore.

The **Breaking Line** point must fall between the two sides of the gore and sets the location of the point at which the chevron diverts in a different direction.

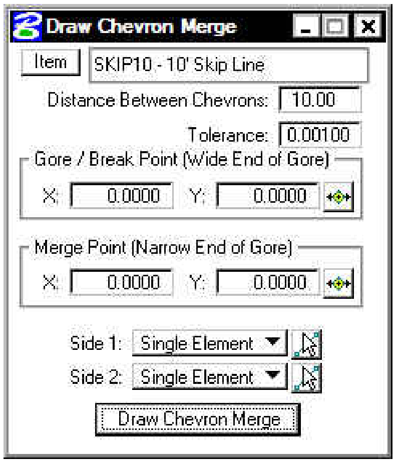
The **Point** represents the narrow end of the gore where chevrons are to stop.

Use the **Side 1** and **Side 2** buttons to identify the sides of the gore. Once the **Draw Chevron Diverge** button is selected, the chevrons are displayed.


DrawChevron Diverge
Item
Gore Point (Wide End of Gore)
Breaking Line
Diverge Point (Narrow End of Gore)
Draw Chevron Diverge

Item: SKIP10 - 10' Skip Line
Distance Between Chevrons: 10.00
Tolerance: 0.00100
Gore Point (Wide End of Gore) X: 0.0000 Y: 0.0000
Breaking Line X: 0.0000 Y: 0.0000
Diverge Point (Narrow End of Gore) X: 0.0000 Y: 0.0000
Side 1: Single Element
Side 2: Single Element

8.2.5.5 Chevron Merge



Item: SKIP10 - 10' Skip Line

Distance Between Chevrons: 10.00

Tolerance: 0.00100

Gore / Break Point (Wide End of Gore)
X: 0.0000 Y: 0.0000

Merge Point (Narrow End of Gore)
X: 0.0000 Y: 0.0000

Side 1: Single Element

Side 2: Single Element

This process works basically the same as Chevron Diverge except the two points, Gore and Breaking Line, have been combined into one point that serves both functions.

The **Gore and Break DP** should be located near the wide end of the chevron. It simultaneously sets the beginning of the pavement markings and the point at which the chevron will break.

The remainder of the process is as described above.

LAB 8: Quantities with D&C Manager

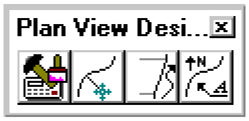
8.1 Accessing Plans Production Tools

Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB8.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\vdot\PlansPrep\d17682Traffic.dgn**.

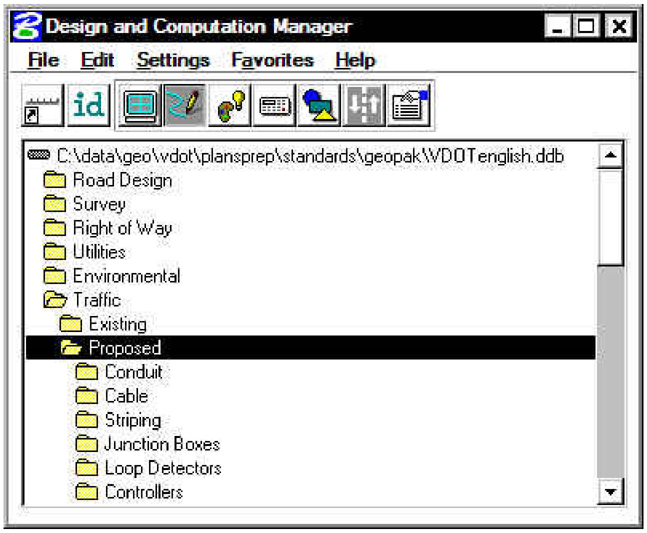
Step 3. Access the Road Workflow dialog box in Project Manager.

Click the **Plan View Design** button. This opens the Plan View Design tools tool frame. Open **Design and Computation Manager** by clicking the left most icon.


Plan View Desi...

Step 4. D&C Manager should open up to the standard **VDOTenglish.ddb**.

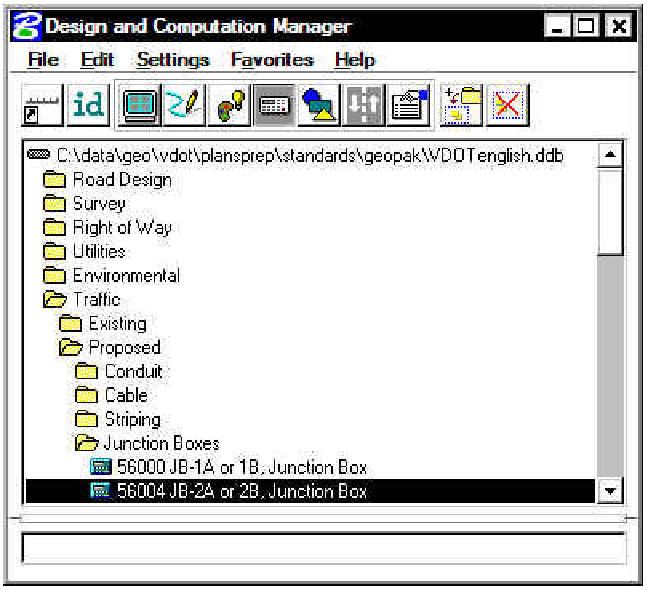
Navigate to the category **Traffic > Proposed** as shown.


Design and Computation Manager
File
Edit
Settings
Favorites
Help
id
C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
Road Design
Survey
Right of Way
Utilities
Environmental
Traffic
Existing
Proposed
Conduit
Cable
Striping
Junction Boxes
Loop Detectors
Controllers

8.2 Compute Quantities

Step 1. Set the current D&C mode to **Compute**.

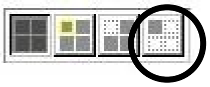
Highlight the item **Junction Boxes > 56004 JB-2A or 2B, Junction Box**. This will make it the active item for computing quantities.


Design and Computation Manager
File
Edit
Settings
Favorites
Help

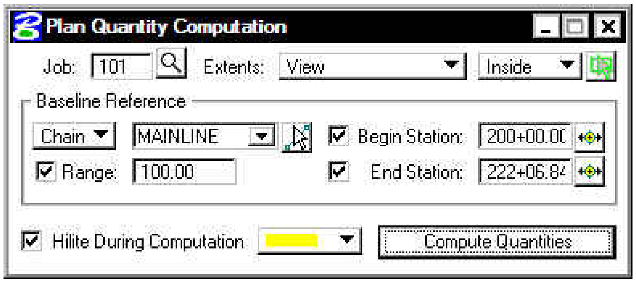
C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
    - Conduit
    - Cable
    - Striping
    - Junction Boxes
      - 56000 JB-1A or 1B, Junction Box
      - 56004 JB-2A or 2B, Junction Box

Step 2. Use the Display options to make sure there are graphics to compute for this item.

By clicking on the icon as shown below, all graphics except the appropriate Junction Box graphics should be turned off.



Step 3. Populate the supplemental dialog box as shown below.


Plan Quantity Computation
Baseline Reference
Compute Quantities

Job: 101 Extents: View Inside

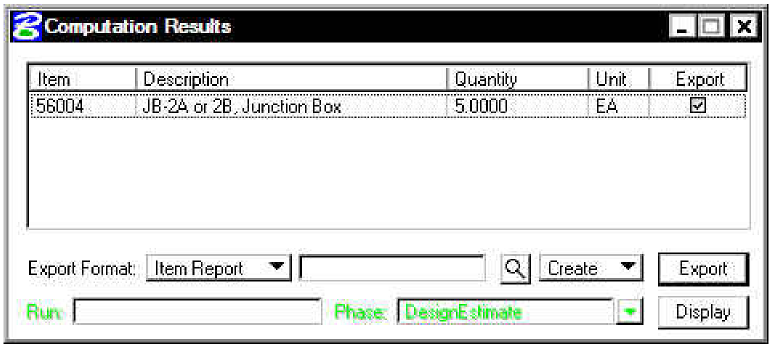
Chain MAINLINE ☑ Begin Station: 200+00.0(

☑ Range: 100.00 ☑ End Station: 222+06.8(

☑ Hilite During Computation

Step 4. Since we are doing the quantities based on what is displayed in View 1, be certain to fit all graphics in View 1.

Step 5. Click **Compute Quantities**. Review the output.


Computation Results
Create
Export
Display

Item	Description	Quantity	Unit	Export
56004	JB-2A or 2B, Junction Box	5.0000	EA	☑

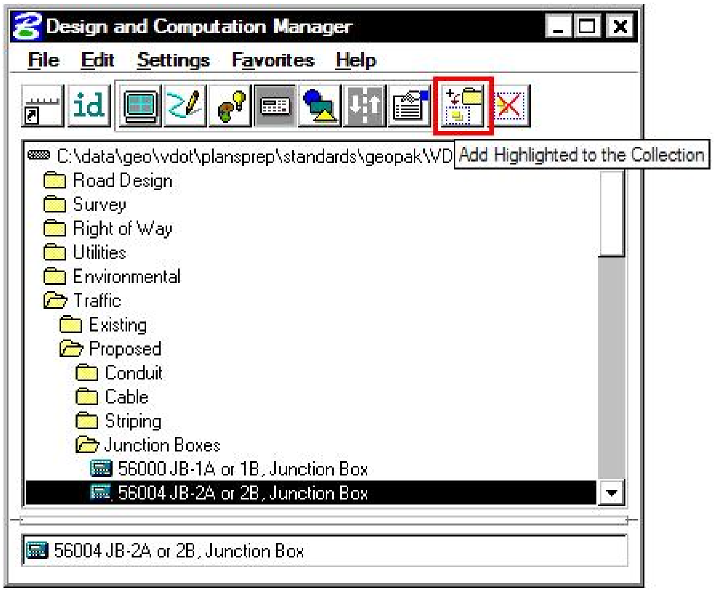
Export Format: Item Report

Run:

Phase: DesignEstimate

Step 6. Now let's see how to compute multiple items at one time.

Returning to the main D&C dialog box, add the Junction Box item to the collection box as shown:


Design and Computation Manager
File
Edit
Settings
Favorites
Help
Add Highlighted to the Collection
C:\data\geo\vdot\plansprep\standards\geopak\VD
Road Design
Survey
Right of Way
Utilities
Environmental
Traffic
Existing
Proposed
Conduit
Cable
Striping
Junction Boxes
56000 JB-1A or 1B, Junction Box
56004 JB-2A or 2B, Junction Box

56004 JB-2A or 2B, Junction Box

Step 7. Also, add the items listed below to the collection box:

Traffic > Proposed > Pole Foundations > 51234 Concrete Foundation Signal Pole

Traffic > Proposed > Controllers > 51030 Prop. Controller Cabinet

Traffic > Proposed > Signal Pole Mast Arms > 51309 SIG. POLE MP-1 ONE ARM 22FT

Traffic > Proposed > Signal Pole Mast Arms > 51321 SIG. POLE MP-1 ONE ARM 34FT

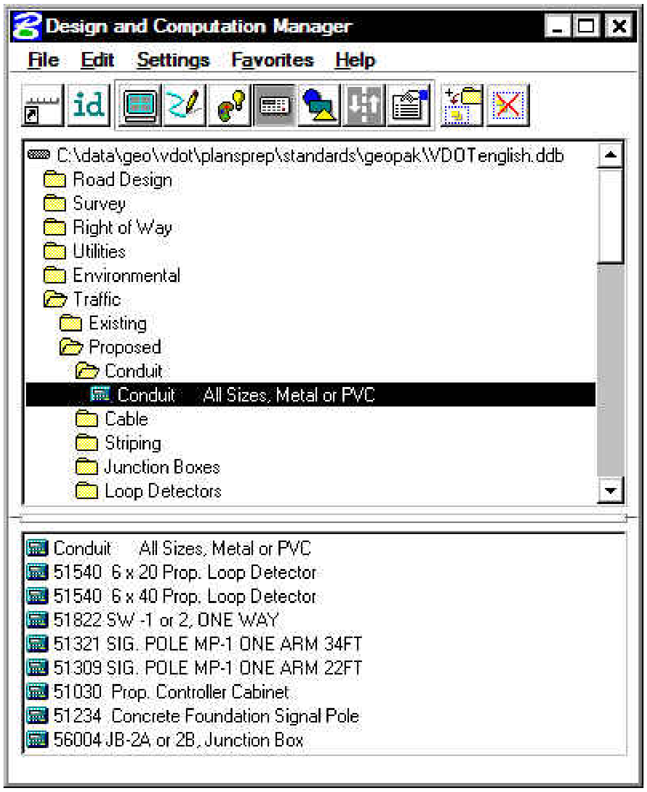
Traffic > Proposed > Hanger Assemblies > 51822 SW -1 or 2, ONE WAY

Traffic > Proposed > Loop Detectors > 51540 6 x 40 Prop. Loop Detector

Traffic > Proposed > Loop Detectors > 51540 6 x 20 Prop. Loop Detector

Traffic > Proposed > Conduit > All Sizes, Metal or PVC

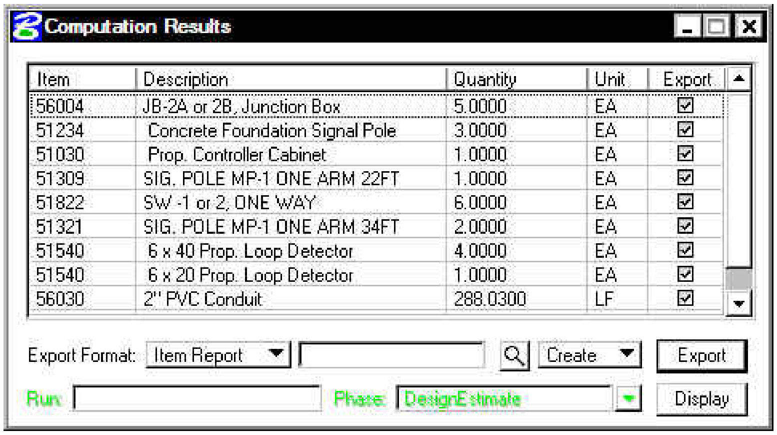
The **D & C Manager** dialog box should appear as below.



C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
    - Conduit
      - Conduit All Sizes, Metal or PVC
    - Cable
    - Striping
    - Junction Boxes
    - Loop Detectors

Conduit All Sizes, Metal or PVC
51540 6 x 20 Prop. Loop Detector
51540 6 x 40 Prop. Loop Detector
51822 SW -1 or 2, ONE WAY
51321 SIG. POLE MP-1 ONE ARM 34FT
51309 SIG. POLE MP-1 ONE ARM 22FT
51030 Prop. Controller Cabinet
51234 Concrete Foundation Signal Pole
56004 JB-2A or 2B, Junction Box

Step 8. Click **Compute**. Review the output.



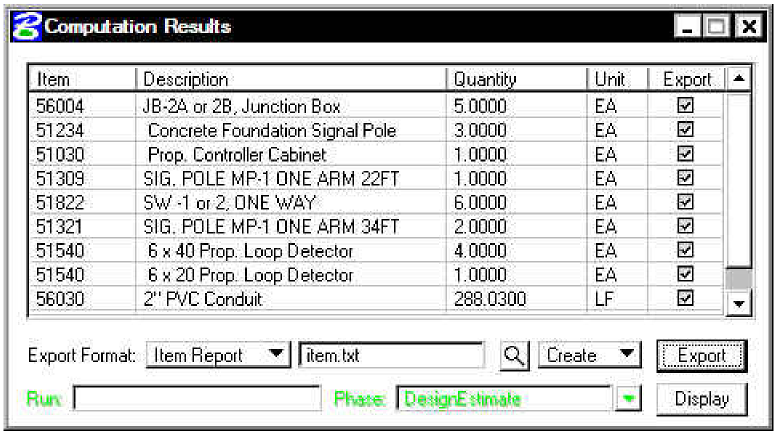
Item	Description	Quantity	Unit	Export
56004	JB-2A or 2B, Junction Box	5.0000	EA	☑
51234	Concrete Foundation Signal Pole	3.0000	EA	☑
51030	Prop. Controller Cabinet	1.0000	EA	☑
51309	SIG. POLE MP-1 ONE ARM 22FT	1.0000	EA	☑
51822	SW -1 or 2, ONE WAY	6.0000	EA	☑
51321	SIG. POLE MP-1 ONE ARM 34FT	2.0000	EA	☑
51540	6 x 40 Prop. Loop Detector	4.0000	EA	☑
51540	6 x 20 Prop. Loop Detector	1.0000	EA	☑
56030	2" PVC Conduit	288.0300	LF	☑

Export Format: Item Report

Run:

Phase: DesignEstimate

Step 9. Next we will export the quantities to an Item Report. Set the **Export Format** option to **Item Report**. Enter the output file name **item.txt**. The dialog should appear as below.



Item	Description	Quantity	Unit	Export
56004	JB-2A or 2B, Junction Box	5.0000	EA	☑
51234	Concrete Foundation Signal Pole	3.0000	EA	☑
51030	Prop. Controller Cabinet	1.0000	EA	☑
51309	SIG. POLE MP-1 ONE ARM 22FT	1.0000	EA	☑
51822	SW -1 or 2, ONE WAY	6.0000	EA	☑
51321	SIG. POLE MP-1 ONE ARM 34FT	2.0000	EA	☑
51540	6 x 40 Prop. Loop Detector	4.0000	EA	☑
51540	6 x 20 Prop. Loop Detector	1.0000	EA	☑
56030	2" PVC Conduit	288.0300	LF	☑

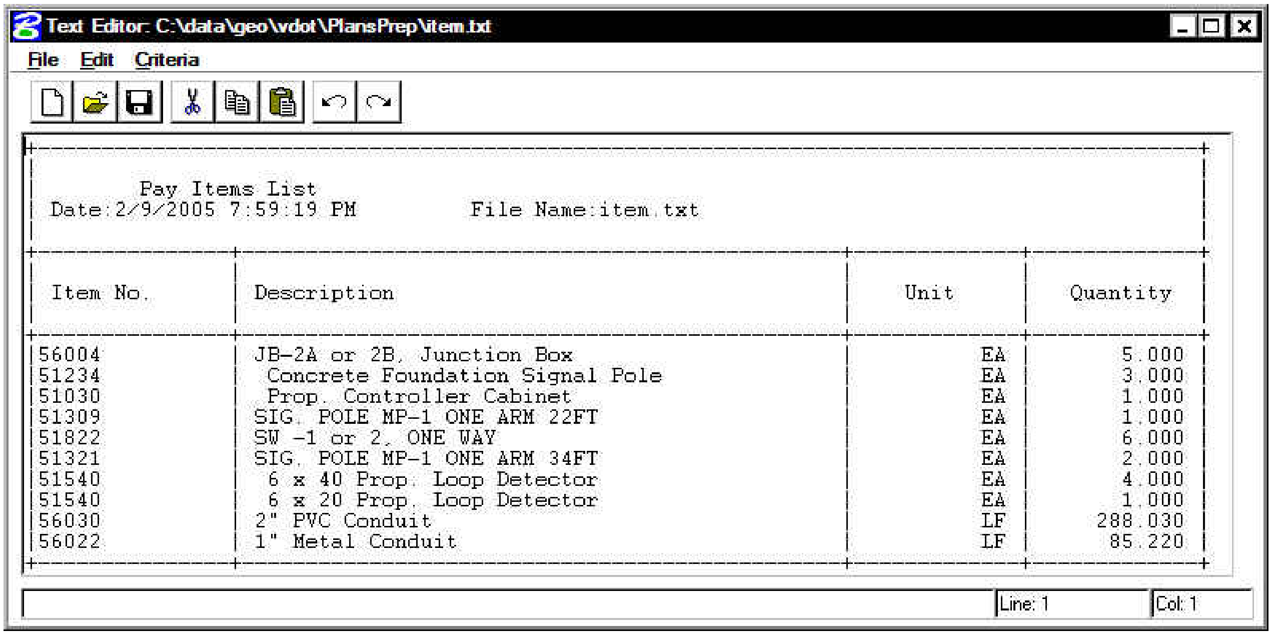
Export Format: Item Report item.txt

Run:

Phase: DesignEstimate

Step 10. Click **Export**. A file named **item.txt** should be created in the working directory.

Step 11. Open **item.txt** using the GEOPAK editor. The file should appear as below.



```
+-----------------------------------------------------------------------------------------------+
|                                                                                               |
|       Pay Items List                                                                          |
| Date:2/9/2005 7:59:19 PM        File Name:item.txt                                            |
|                                                                                               |
+----------------+------------------------------------------------+--------------+--------------+
|                |                                                |              |              |
| Item No.       | Description                                    |     Unit     |   Quantity   |
|                |                                                |              |              |
+----------------+------------------------------------------------+--------------+--------------+
|56004           | JB-2A or 2B, Junction Box                      |           EA |        5.000 |
|51234           |  Concrete Foundation Signal Pole               |           EA |        3.000 |
|51030           |  Prop. Controller Cabinet                      |           EA |        1.000 |
|51309           | SIG. POLE MP-1 ONE ARM 22FT                    |           EA |        1.000 |
|51822           | SW -1 or 2, ONE WAY                            |           EA |        6.000 |
|51321           | SIG. POLE MP-1 ONE ARM 34FT                    |           EA |        2.000 |
|51540           |  6 x 40 Prop. Loop Detector                    |           EA |        4.000 |
|51540           |  6 x 20 Prop. Loop Detector                    |           EA |        1.000 |
|56030           | 2" PVC Conduit                                 |           LF |      288.030 |
|56022           | 1" Metal Conduit                               |           LF |       85.220 |
+----------------+------------------------------------------------+--------------+--------------+
```

Step 12. Dismiss the GEOPAK editor.

Step 13. **Exit** Design and Computation Manager.

Step 14. **Exit** MicroStation.

LAB 9: Special Applications

9.1 Right of Way Data Sheet

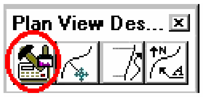
This special application will read an Excel spreadsheet created from RUMS. It will then take the information from the spreadsheet and automatically fill out a Right of Way Data Sheet.

Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB9.EXE**.

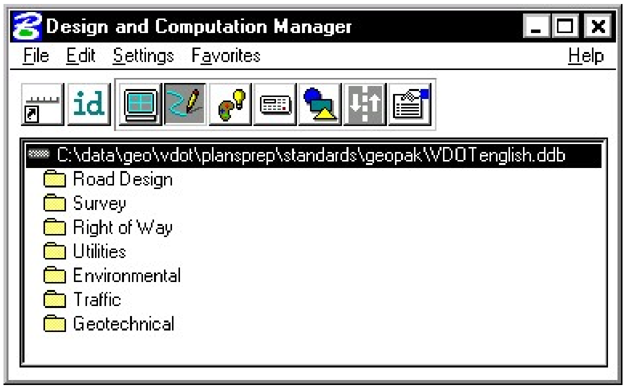
Step 2. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682RWSheet.dgn**

Step 3. Access **Project Manager**. It should automatically access the Road workflow dialog box since we “remembered” the options in Exercise 2.

Step 4. Select the icon **Plan View Design** button from the **Road Project: 17682.prj** workflow dialog box, which opens the Plan View Design tool box.

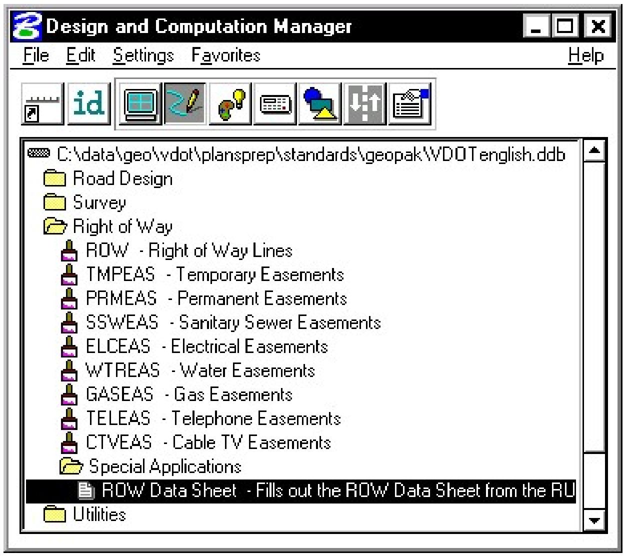


Step 5. Select the Design and Computation Manager icon (as indicated above) to invoke the Design and Computation Manager shown below.



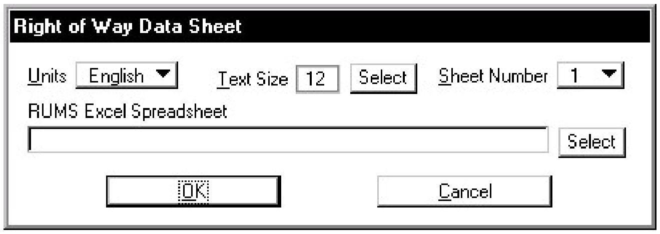
C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
- Geotechnical

Step 6. Navigate to the item shown in the dialog box below.


Design and Computation Manager
File
Edit
Settings
Favorites
Help

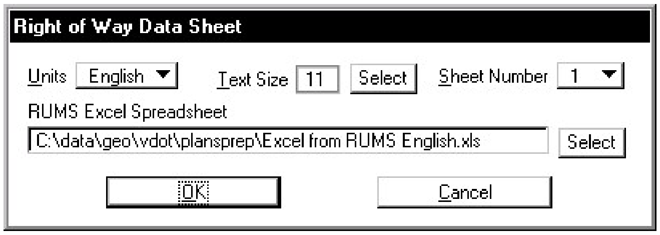
C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
Road Design
Survey
Right of Way
ROW - Right of Way Lines
TMPEAS - Temporary Easements
PRMEAS - Permanent Easements
SSWEAS - Sanitary Sewer Easements
ELCEAS - Electrical Easements
WTREAS - Water Easements
GASEAS - Gas Easements
TELEAS - Telephone Easements
CTVEAS - Cable TV Easements
Special Applications
ROW Data Sheet - Fills out the ROW Data Sheet from the RU
Utilities

Step 7. **Double-Click** on the item to kick off the application. You will see the dialog below:


Right of Way Data Sheet
Select
Select
OK
Cancel

Units English
Text Size 12
Sheet Number 1
RUMS Excel Spreadsheet

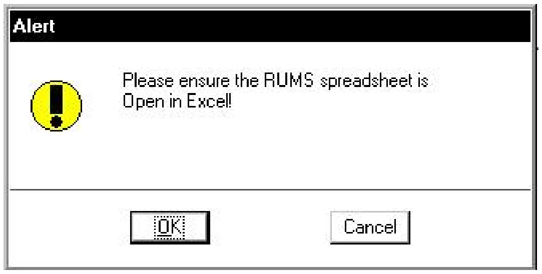
Step 8. Using the **Select** buttons on the dialog, set the dialog to appear as shown below:


Right of Way Data Sheet
Select
Select
OK
Cancel

Units English
Text Size 11
Sheet Number 1
RUMS Excel Spreadsheet
C:\data\geo\vdot\plansprep\Excel from RUMS English.xls

Step 9. Click **OK**.

Step 10. You will see the following warning:


Alert
OK
Cancel

Please ensure the RUMS spreadsheet is
Open in Excel!

❗ In order for this application to work correctly, the Excel spreadsheet containing the information from RUMS **MUST** be open. If it's not, the application will not be able to read it.

Step 11. At this point we need to open the Excel spreadsheet (**Excel From RUMS English.xls**).

Minimize MicroStation, open the spreadsheet in Excel, then re-expand MicroStation to continue our application.

❗ Note that when the spreadsheet was opened makes no difference (i.e. it could have been opened before we kicked off the application). It only matters that the spreadsheet is opened before we continue from this point.

Step 12. Click **OK**.

Step 13. **Dismiss** D&C Manager and review the information plotted on the sheet.

Step 14. **Exit** MicroStation.

Step 15. **Exit** Excel.

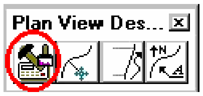
9.2 Traffic Engineering Conduit and Cable Placement

This special application automates the placement and computations of conduit and cable.

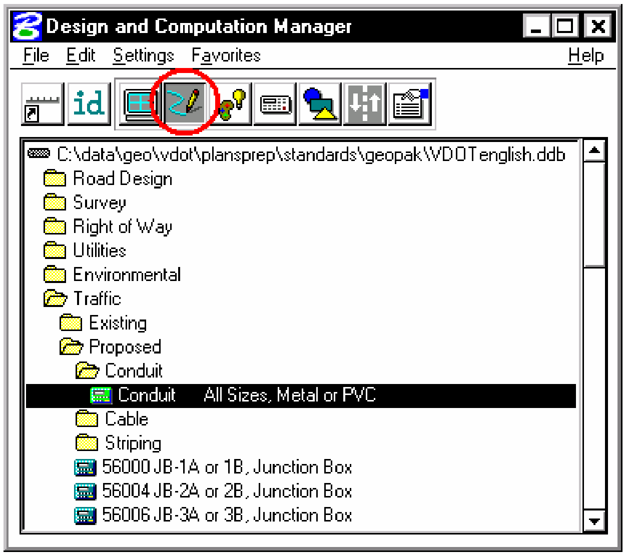
Step 1. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682Traffic.dgn**

Step 2. Access **Project Manager**. It should automatically access the Road workflow dialog box since we "remembered" the options in Exercise 2.

Step 3. Select the icon **Plan View Design** button from the **Road Project: 17682.prj** workflow dialog box, which opens the Plan View Design tool box.

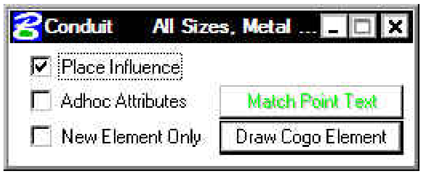

Plan View Des...

Step 4. Navigate to the item as shown below and make sure that you have the Design Mode icon selected.


Design and Computation Manager
File Edit Settings Favorites Help

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
    - Conduit
      - Conduit All Sizes, Metal or PVC
    - Cable
    - Striping
    - 56000 JB-1A or 1B, Junction Box
    - 56004 JB-2A or 2B, Junction Box
    - 56006 JB-3A or 3B, Junction Box

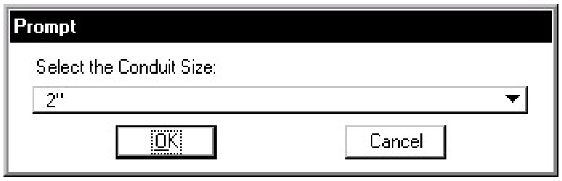
Step 5. In the secondary dialog, enable the **Place Influence** toggle.


Conduit All Sizes, Metal ...
Match Point Text
Draw Cogo Element

☑ Place Influence
☐ Adhoc Attributes
☐ New Element Only

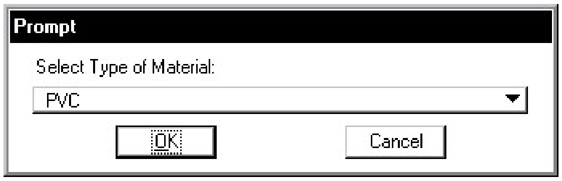
Step 6. With the Conduit item selected (Step 4) and the Place Influence toggle enabled (Step 5), place a Microstation line between Junction #1 and Junction #2.

Step 7. When prompted, set the Conduit size to **2”** then click **OK**.


Prompt
OK
Cancel

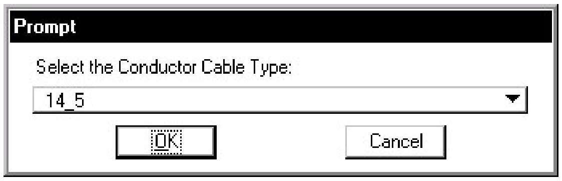
Select the Conduit Size: 2"

Step 8. Set the Conduit Material type to **PVC** then click **OK**.


Prompt
OK
Cancel

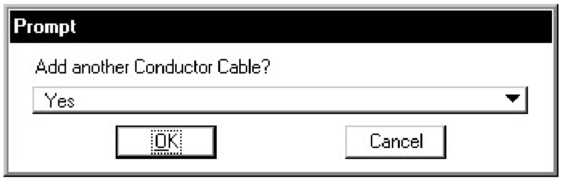
Select Type of Material: PVC

Step 9. Set the Conductor Cable type to **14/5** then click **OK**.


Prompt
OK
Cancel

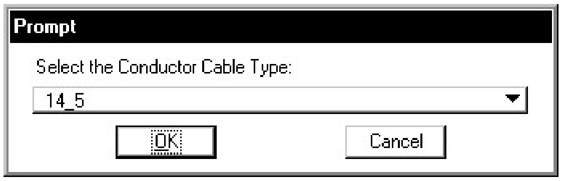
Select the Conductor Cable Type: 14_5

Step 10. When prompted to add another conductor cable, select **Yes** then click **OK**.


Prompt
OK
Cancel

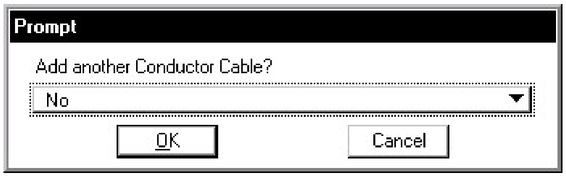
Add another Conductor Cable? Yes

Step 11. Set the Conductor Cable Type again to **14/5** then click **OK**.


Prompt
OK
Cancel

Select the Conductor Cable Type: 14_5

Step 12. When prompted to add another conductor cable, select **No** then click **OK**.

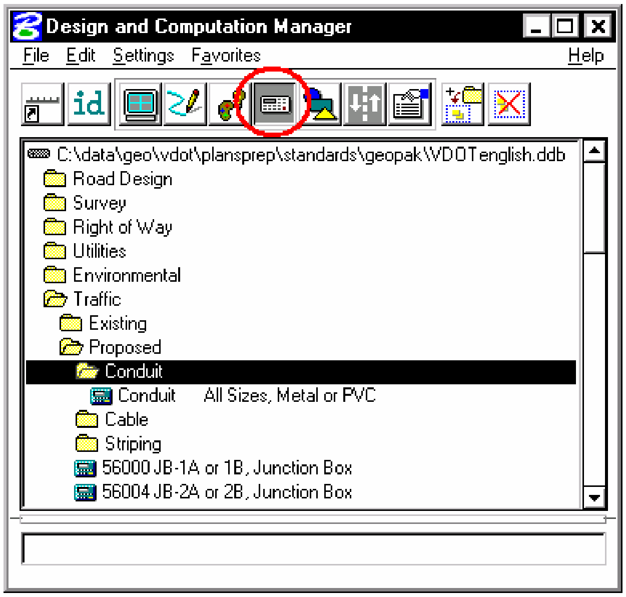

Prompt
OK
Cancel

Add another Conductor Cable? No

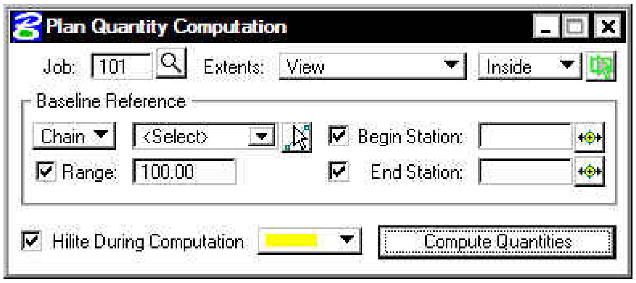
Step 13. Repeat steps 6-12. This time place a 3” Metal conduit between Junction #2 and Junction #3 and place two 14/2 Shielded conductor cables.

Step 14. Repeat steps 6-12. This time place a 2” PVC conduit between Junction #3 and Junction #4 and place two 14/2 Shielded conductor cables.

Step 15. Select the Compute Mode icon as shown. The secondary dialog will change.


Design and Computation Manager
File Edit Settings Favorites Help

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
    - Conduit
      - Conduit All Sizes, Metal or PVC
    - Cable
    - Striping
    - 56000 JB-1A or 1B, Junction Box
    - 56004 JB-2A or 2B, Junction Box


Plan Quantity Computation
Baseline Reference
Compute Quantities

Job: 101 Extents: View Inside

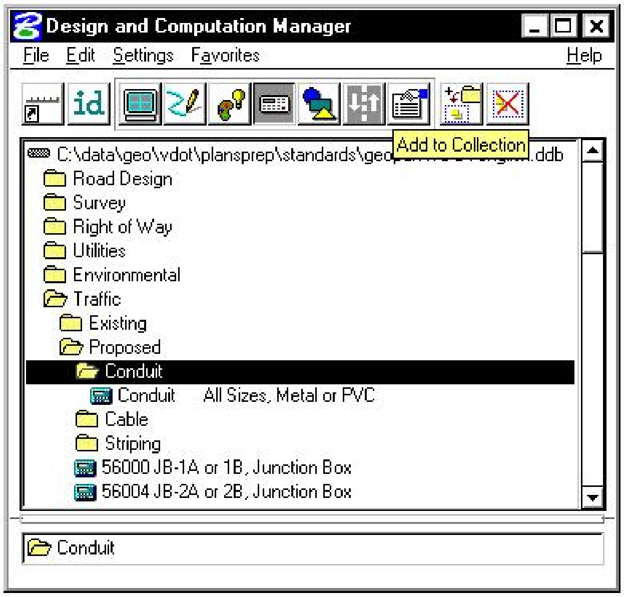
Chain <Select>

☑ Begin Station:

☑ Range: 100.00 ☑ End Station:

☑ Hilite During Computation

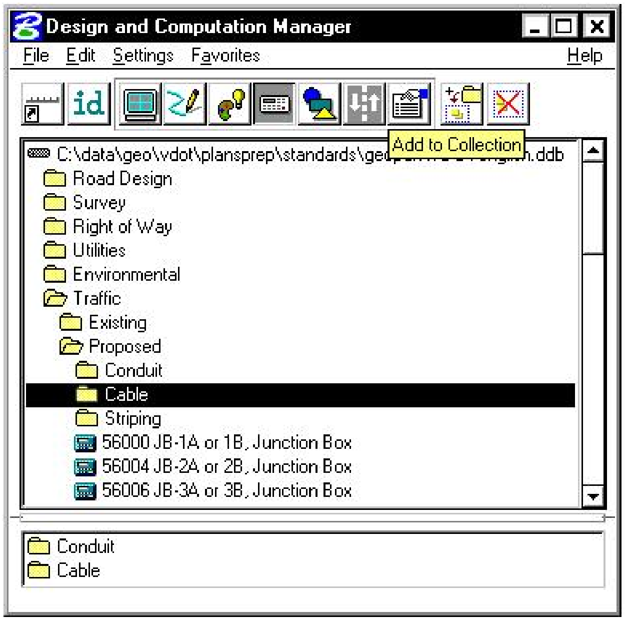
Step 16. Press the **Add to Collection Box** icon to add the Conduit item to the collection box.


Design and Computation Manager
File Edit Settings Favorites Help
Add to Collection

C:\data\geo\vdot\plansprep\standards\geo… .ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
    - Conduit
      - Conduit All Sizes, Metal or PVC
    - Cable
    - Striping
    - 56000 JB-1A or 1B, Junction Box
    - 56004 JB-2A or 2B, Junction Box

Conduit

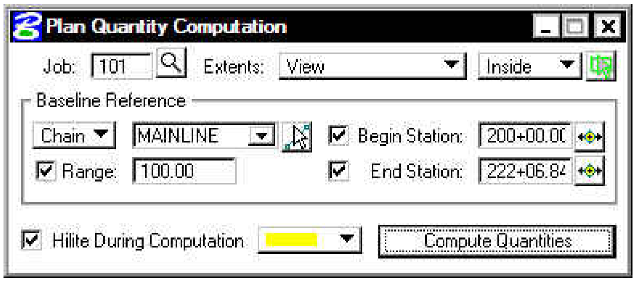
Step 17. Highlight the **Cable** category then press the **Add to Collection Box** icon again to add the Cable category the collection box.


Design and Computation Manager
File
Edit
Settings
Favorites
Help
Add to Collection

C:\data\geo\vdot\plansprep\standards\ge n.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
    - Conduit
    - Cable
    - Striping
    - 56000 JB-1A or 1B, Junction Box
    - 56004 JB-2A or 2B, Junction Box
    - 56006 JB-3A or 3B, Junction Box

Conduit
Cable

Step 18. Populate the secondary dialog as shown.

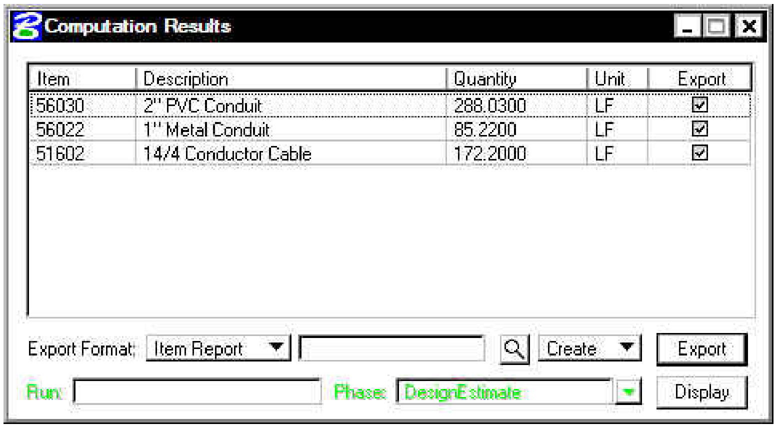

Plan Quantity Computation
Compute Quantities

Job: 101
Extents: View
Inside

Baseline Reference
Chain MAINLINE
☑ Begin Station: 200+00.0
☑ Range: 100.00
☑ End Station: 222+06.8
☑ Hilite During Computation

Step 19. Ensure that the **Conduit and Cable** placed in steps 4 through 14 is displayed in the view then click the **Compute Quantities** button.

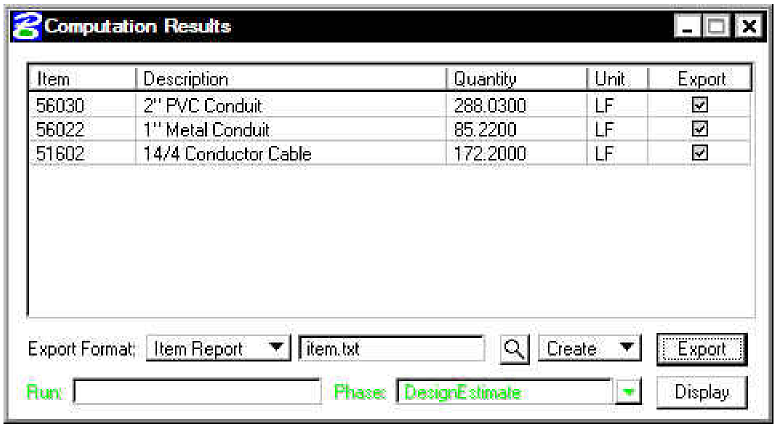
Step 20. A sample output is shown below. Your actual quantities may differ depending on the placement of the Conduit.


Computation Results
Create
Export
Display

Item	Description	Quantity	Unit	Export
56030	2" PVC Conduit	288.0300	LF	☑
56022	1" Metal Conduit	85.2200	LF	☑
51602	14/4 Conductor Cable	172.2000	LF	☑

Export Format: Item Report
Run:
Phase: DesignEstimate

Step 21. Next we will export the quantities to an Item Report. Set the **Export Format** option to **Item Report**. Enter the output file name **item.txt**. The dialog should appear as below.


Computation Results
Create
Export
Display

Item	Description	Quantity	Unit	Export
56030	2" PVC Conduit	288.0300	LF	☑
56022	1" Metal Conduit	85.2200	LF	☑
51602	14/4 Conductor Cable	172.2000	LF	☑

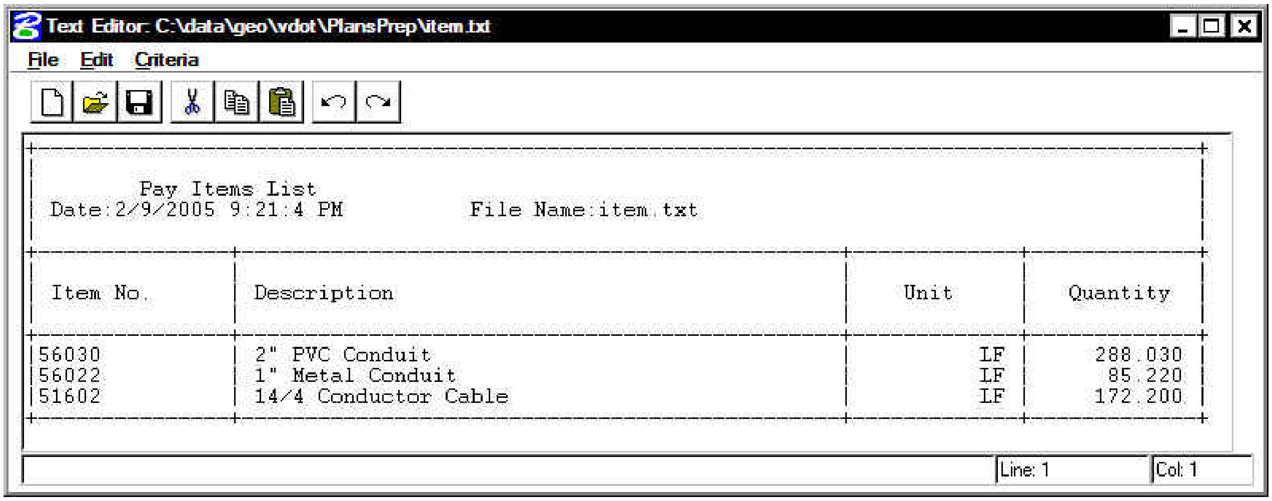
Export Format: Item Report item.txt

Run:

Phase: DesignEstimate

Step 22. Click **Export**. A file named **item.txt** should be created in the working directory.

Step 23. Open **item.txt** using the GEOPAK editor. The file should appear as below.


Text Editor: C:\data\geo\vdot\PlansPrep\item.txt
File
Edit
Criteria
Line: 1
Col: 1

```
+-----------------------------------------------------------------------------------------------+
|                                                                                               |
|        Pay Items List                                                                         |
| Date:2/9/2005 9:21:4 PM          File Name:item.txt                                          |
|                                                                                               |
+----------------+------------------------------------------------+--------------+--------------+
|                |                                                |              |              |
| Item No.       | Description                                    |     Unit     |   Quantity   |
|                |                                                |              |              |
+----------------+------------------------------------------------+--------------+--------------+
|56030           | 2" PVC Conduit                                 |           LF |      288.030 |
|56022           | 1" Metal Conduit                               |           LF |       85.220 |
|51602           | 14/4 Conductor Cable                           |           LF |      172.200 |
+----------------+------------------------------------------------+--------------+--------------+
```

Step 24. Dismiss the GEOPAK editor.

Step 25. Dismiss the **Computation Results** dialog box.

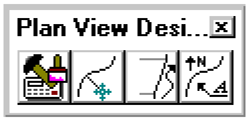
9.3 Pavement Striping

In this section we will place Pavement Striping then compute quantities for the Pavement Striping.

9.3.1 Accessing Plans Production Tools

Step 1. Access the Road Workflow dialog box in Project Manager.

Click the **Plan View Design** button. This opens the Plan View Design tools tool frame. Open **Design and Computation Manager** by clicking the left most icon.

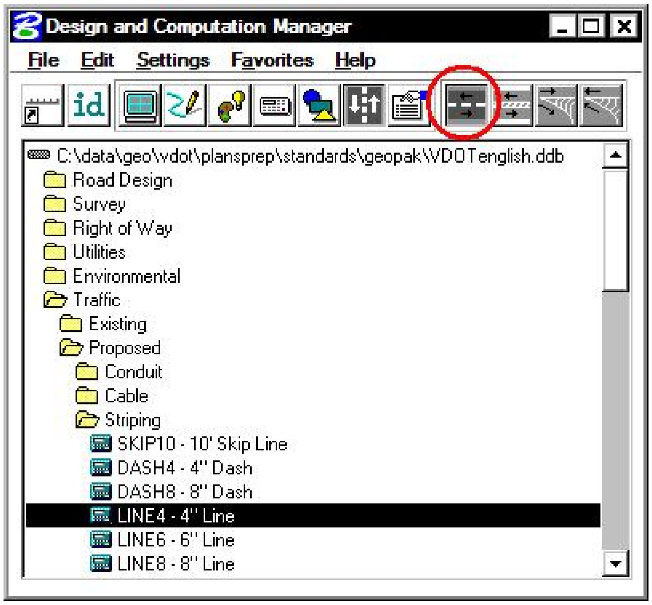


9.3.2 Pavement Striping - Skip

In this section, we are placing pavement striping parallel to the main alignment.

Step 1. Attach the Saved View “**SKIP**”.

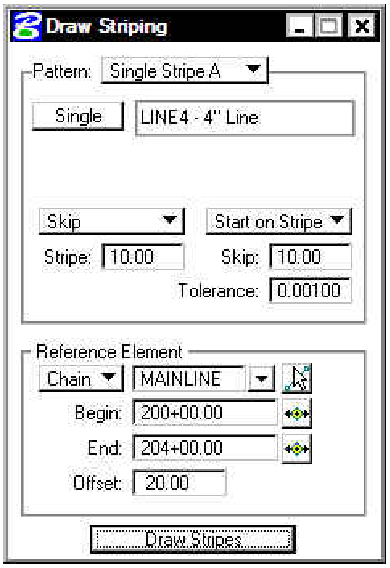
Step 2. Change the Mode to Pavement Marking and select **Traffic > Proposed > Striping > LINE4 – 4’ Line**



C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
    - Conduit
    - Cable
    - Striping
      - SKIP10 - 10' Skip Line
      - DASH4 - 4" Dash
      - DASH8 - 8" Dash
      - LINE4 - 4" Line
      - LINE6 - 6" Line
      - LINE8 - 8" Line

Step 3. Select the **Striping Operation** as shown above to access the Striping dialog box.

Step 4. Populate the **Draw Striping** dialog box as shown below.



Draw Striping

Pattern: Single Stripe A

Single: LINE4 - 4" Line

Skip / Start on Stripe

Stripe: 10.00

Skip: 10.00

Tolerance: 0.00100

Reference Element

Chain: MAINLINE

Begin: 200+00.00

End: 204+00.00

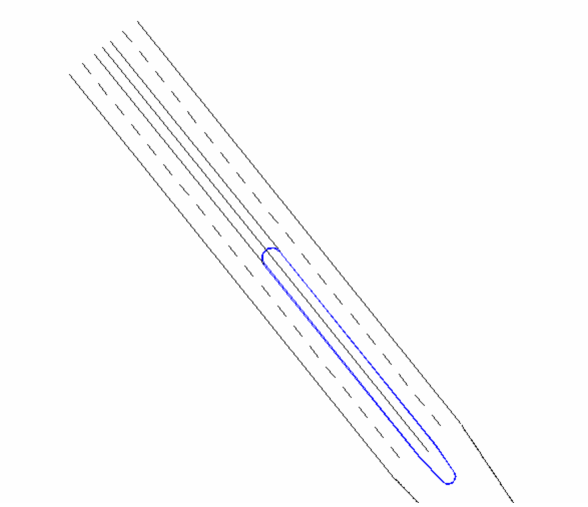
Offset: 20.00

Note: Be sure that your graphic group lock is off before the next step.

Step 5. We are only going to strip a small portion of our project. Click **Draw Stripes**. The striping is attached to the cursor. You can move to either side of the baseline and place the striping. Data point on the left side of the alignment.

Step 6. Click **Reset** (right mouse click).

Step 7. Click **Draw Stripes** again to place the striping on the other side of the road. The finished striping should appear as below.

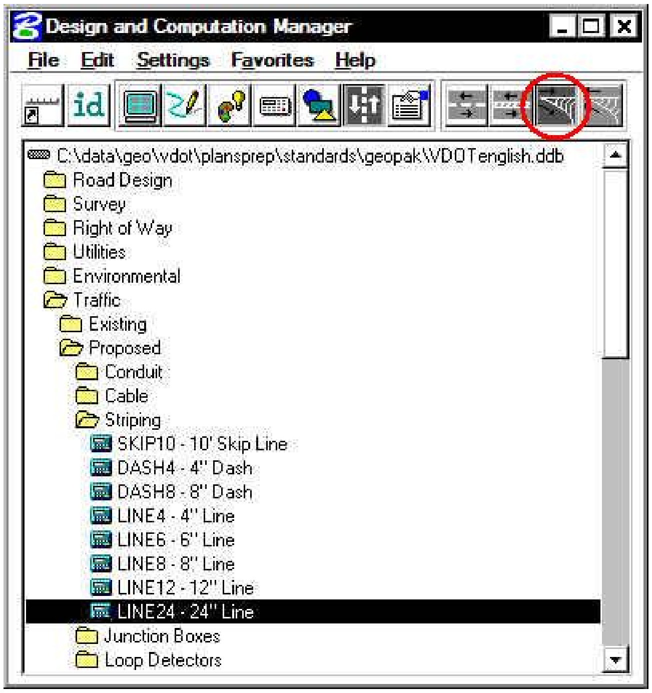


Step 8. Dismiss the **Draw Striping** dialog box by clicking on the **X** in the upper right corner of the dialog box.

9.3.3 Pavement Striping – Gore Area

Step 1. Attach the Saved View "**GORE**".

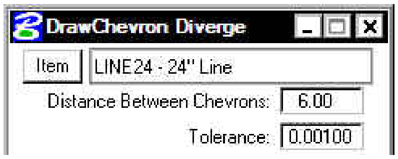
Step 2. Leave the Mode set to Pavement Marking and select **Traffic > Proposed > Striping > LINE24 – 24" Line**


Design and Computation Manager
File Edit Settings Favorites Help

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
    - Conduit
    - Cable
    - Striping
      - SKIP10 - 10' Skip Line
      - DASH4 - 4" Dash
      - DASH8 - 8" Dash
      - LINE4 - 4" Line
      - LINE6 - 6" Line
      - LINE8 - 8" Line
      - LINE12 - 12" Line
      - LINE24 - 24" Line
    - Junction Boxes
    - Loop Detectors

Step 3. Select the **Chevron Diverge Operation** as shown above to access the **Draw Chevron Diverge** dialog box.

Step 4. Populate the top portion of the **Draw Chevron Diverge** dialog box as shown below.

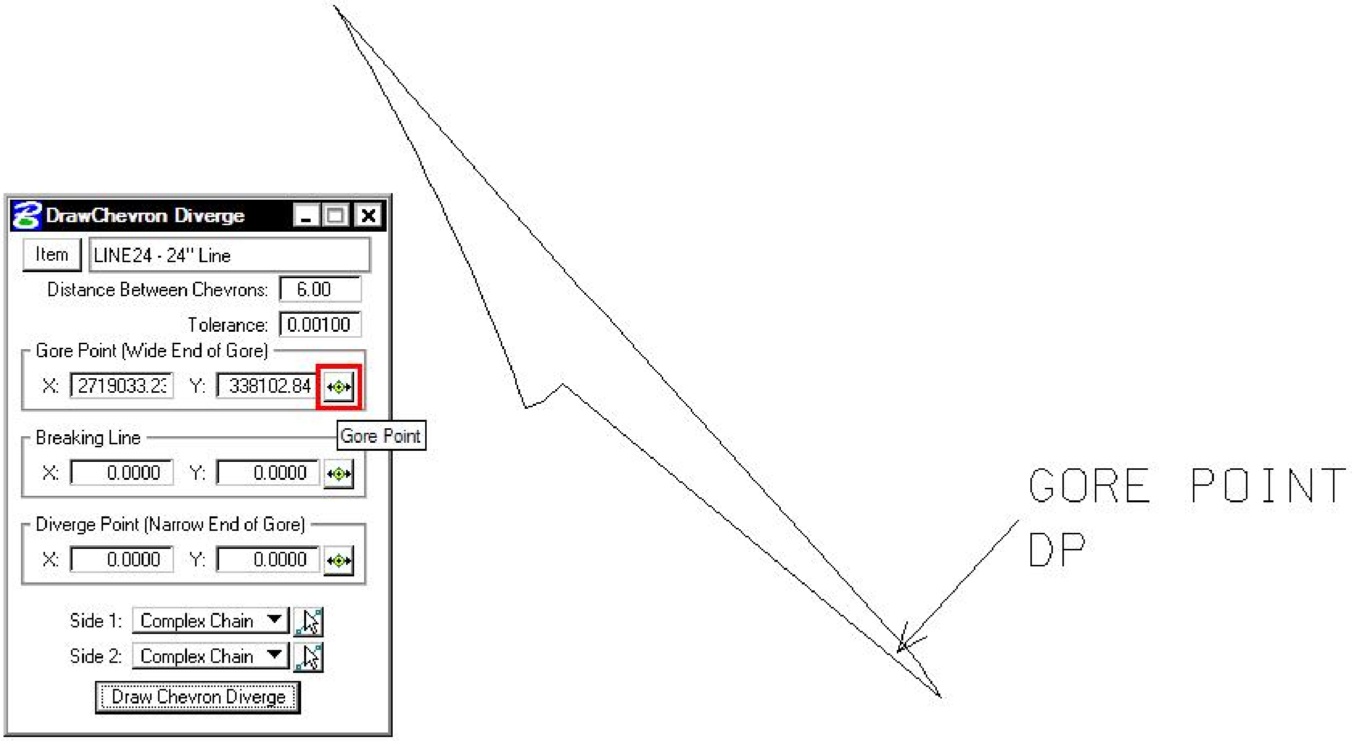

DrawChevron Diverge

Item: LINE24 - 24" Line

Distance Between Chevrons: 6.00

Tolerance: 0.00100

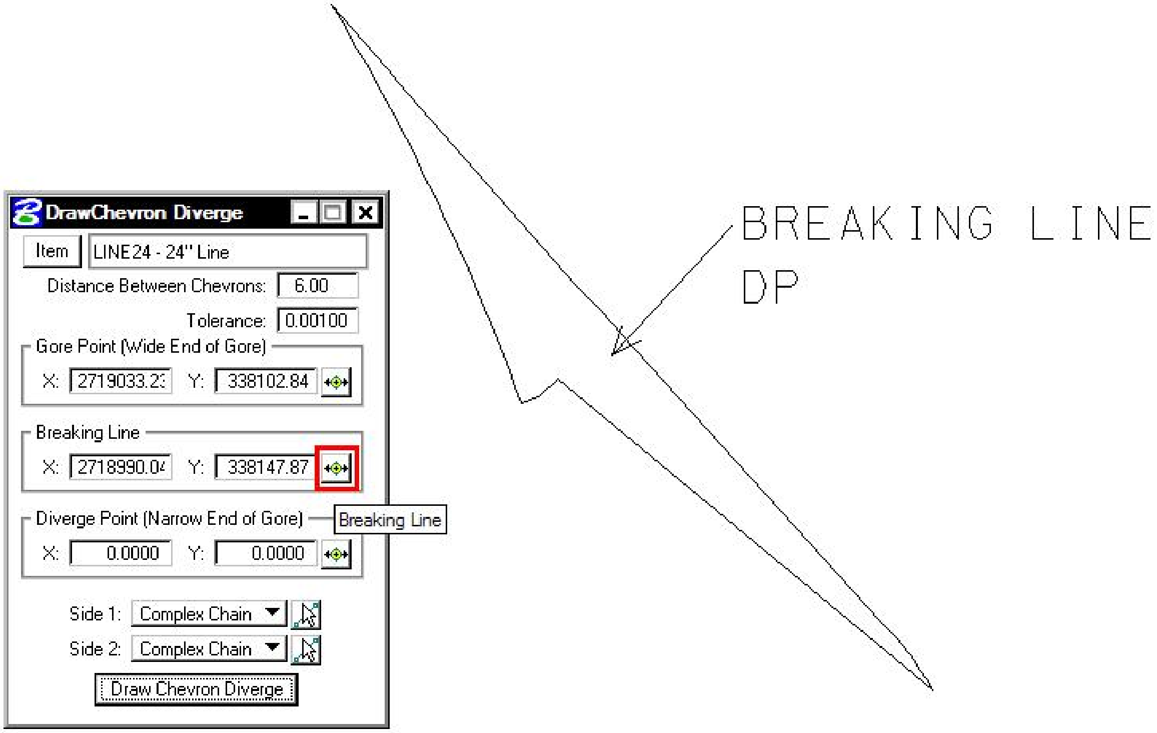
Step 5. Set the **Gore** coordinates by pressing the **Gore Point** button then selecting the location indicated below.



DrawChevron Diverge
Gore Point
Draw Chevron Diverge
GORE POINT
DP

Item: LINE24 - 24" Line
Distance Between Chevrons: 6.00
Tolerance: 0.00100
Gore Point (Wide End of Gore) X: 2719033.2 Y: 338102.84
Breaking Line X: 0.0000 Y: 0.0000
Diverge Point (Narrow End of Gore) X: 0.0000 Y: 0.0000
Side 1: Complex Chain
Side 2: Complex Chain

Step 6. Set the **Breaking Line** coordinates by pressing the **Breaking Line** button then selecting the location indicated below.



DrawChevron Diverge

Item: LINE24 - 24" Line

Distance Between Chevrons: 6.00

Tolerance: 0.00100

Gore Point (Wide End of Gore) X: 2719033.2 Y: 338102.84

Breaking Line X: 2718990.0 Y: 338147.87

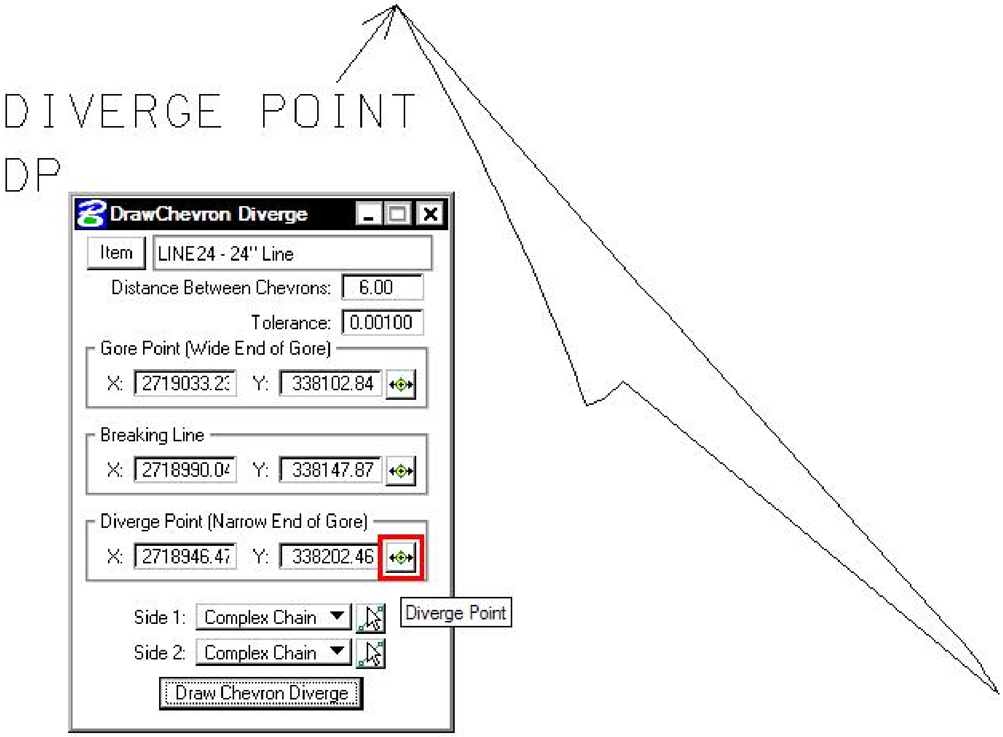
Diverge Point (Narrow End of Gore) X: 0.0000 Y: 0.0000

Side 1: Complex Chain

Side 2: Complex Chain

Breaking Line
Draw Chevron Diverge
BREAKING LINE
DP

Step 7. Set the **Point** coordinates by pressing the **Diverge Point** button then selecting the location indicated below.



Item: LINE24 - 24" Line
Distance Between Chevrons: 6.00
Tolerance: 0.00100
Gore Point (Wide End of Gore) X: 2719033.2 Y: 338102.84
Breaking Line X: 2718990.04 Y: 338147.87
Diverge Point (Narrow End of Gore) X: 2718946.47 Y: 338202.46
Side 1: Complex Chain
Side 2: Complex Chain

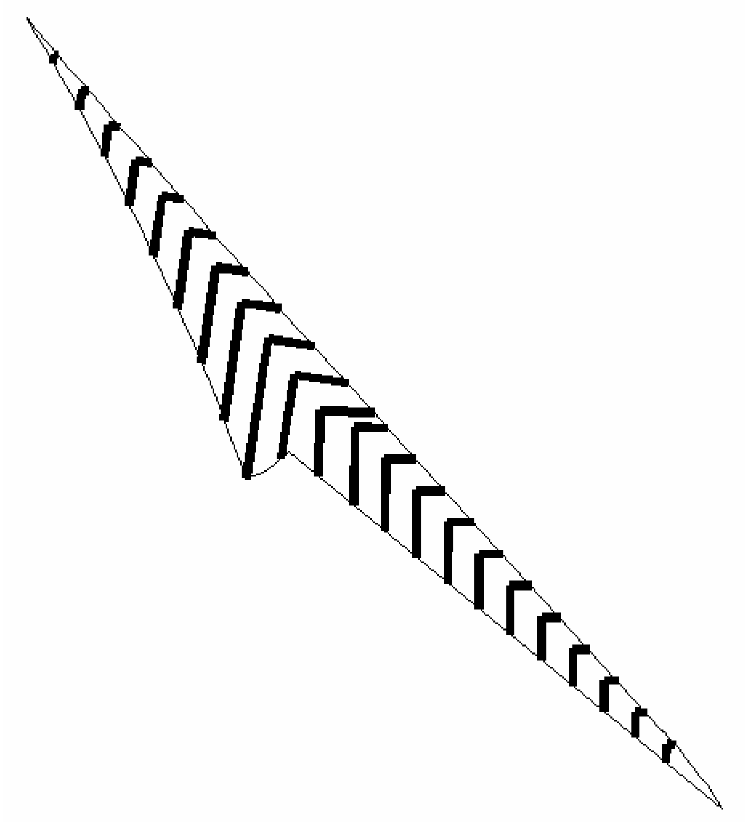
Step 8. Set **Side 1** and **Side 2** options to **Complex Chain**.

Step 9. Click the **Identify DGN Element** button for **Side 1** then select the elements on the **left** side of the gore area. Continue to data point until all the elements have been highlighted.

Step 10. Click the **Identify DGN Element** button for **Side 2** then select the elements on the **right** side of the gore area. Continue to data point until all the elements have been highlighted.

Step 11. Click **Draw Chevron Diverge**, then move the cursor to the inside of the gore area and issue a datapoint.

The gore area should be striped as below.



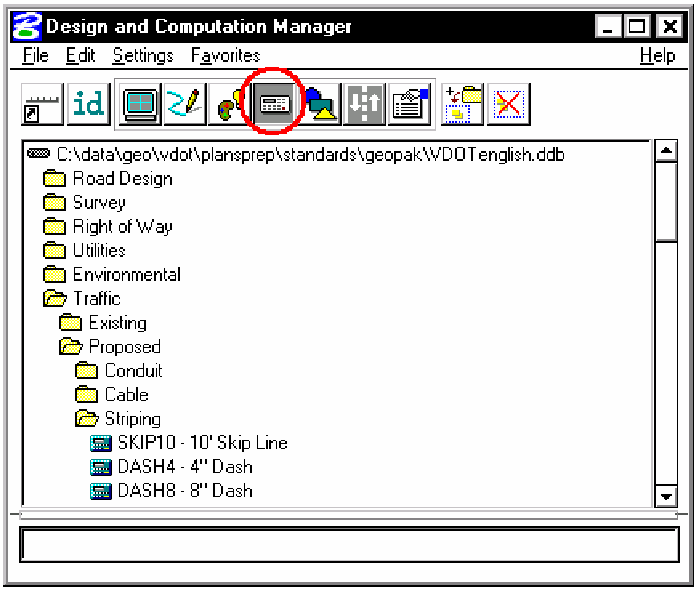
Step 12. Turn on levels 1-7 to review the completed gore area.

Step 13. Dismiss the **Draw Chevron Diverge** dialog box by clicking on the **X** in the upper right corner of the dialog box, but leave the main D&C Manager dialog active.

9.3.4 Compute Quantities

Step 1. Attach the Saved View “**SKIP**”.

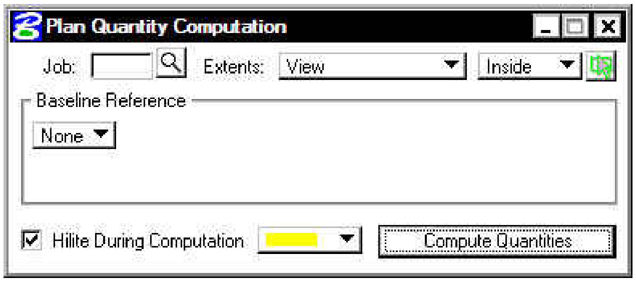
Step 2. Change the current D&C mode to **Compute**.


Design and Computation Manager
File
Edit
Settings
Favorites
Help

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
- Survey
- Right of Way
- Utilities
- Environmental
- Traffic
  - Existing
  - Proposed
    - Conduit
    - Cable
    - Striping
      - SKIP10 - 10' Skip Line
      - DASH4 - 4" Dash
      - DASH8 - 8" Dash

Step 3. Click item **LINE4 – 4” Line** to make it the active item for computing quantities.

Step 4. Set the supplemental dialog box as shown below then click **Compute Quantities**.


Plan Quantity Computation
Compute Quantities

Job:

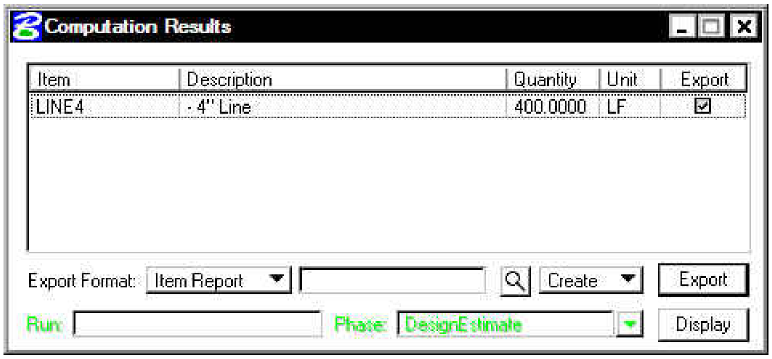
Extents: View

Inside

Baseline Reference: None

☑ Hilite During Computation

Step 5. A sample output is shown below. Your actual quantities may differ.


Computation Results
Create
Export
Display

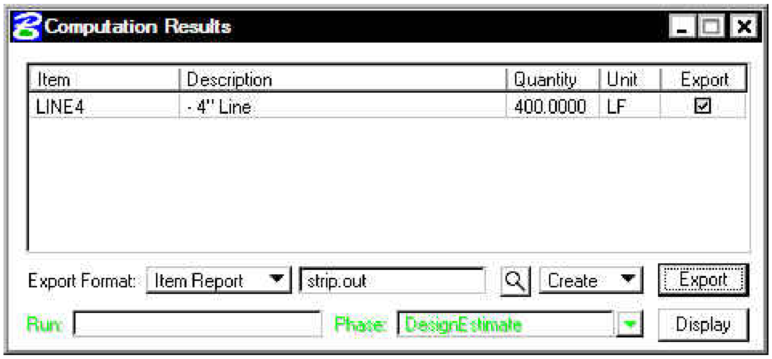
Item	Description	Quantity	Unit	Export
LINE4	- 4" Line	400.0000	LF	☑

Export Format: Item Report

Run:

Phase: DesignEstimate

Step 6. Next we will export the quantities to an Item Report. Set the **Export Format** option to **Item Report**. Enter the output file name **strip.out**. The dialog box should appear as below.



Computation Results

Item	Description	Quantity	Unit	Export
LINE4	- 4" Line	400.0000	LF	☑

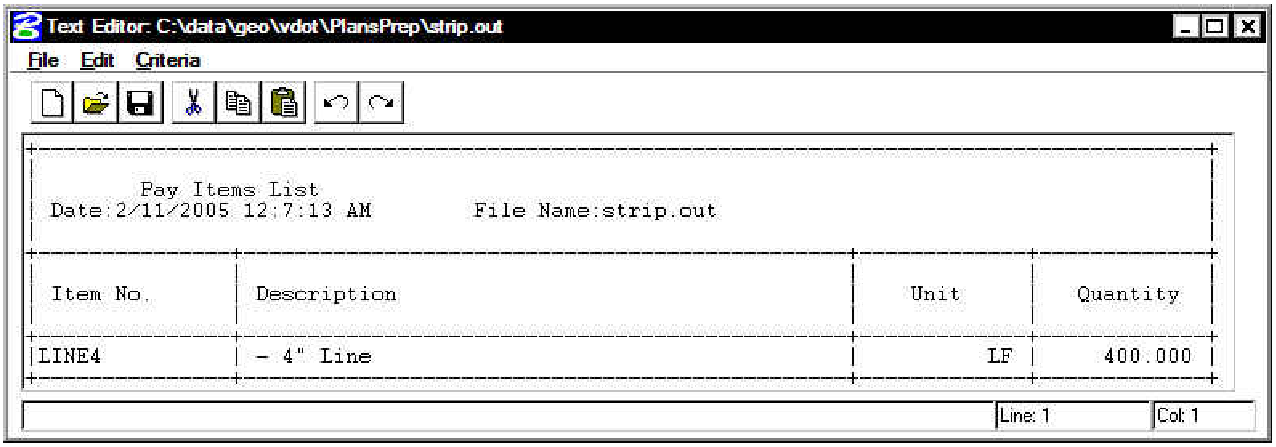
Export Format: Item Report

strip.out

Create
Export
Run:
Phase: DesignEstimate
Display

Step 7. Click **Export**. A file named **strip.out** should be created in the working directory.

Step 8. Open **strip.out** using the GEOPAK editor. The file should appear as below.



Text Editor: C:\data\geo\vdot\PlansPrep\strip.out
File
Edit
Criteria
Line: 1
Col: 1

```
+---------------------------------------------------------------------------------------------+
|                                                                                             |
|        Pay Items List                                                                       |
| Date:2/11/2005 12:7:13 AM       File Name:strip.out                                         |
|                                                                                             |
+---------------+----------------------------------------------+-------------+-------------+
|               |                                              |             |             |
| Item No.      | Description                                  |    Unit     |  Quantity   |
|               |                                              |             |             |
+---------------+----------------------------------------------+-------------+-------------+
|LINE4          | - 4" Line                                    |          LF |    400.000  |
+---------------+----------------------------------------------+-------------+-------------+
```

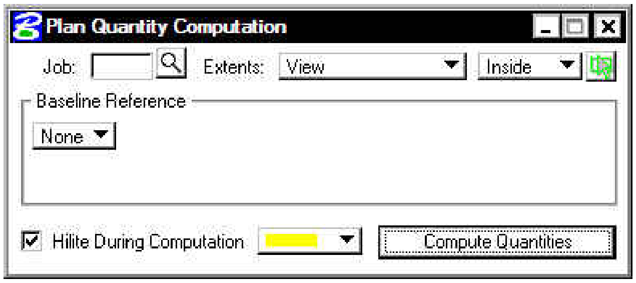
Step 9. Dismiss the GEOPAK editor.

Step 10. Dismiss the **Computation Results** dialog box.

Step 11. Attach the Saved View "**GORE**".

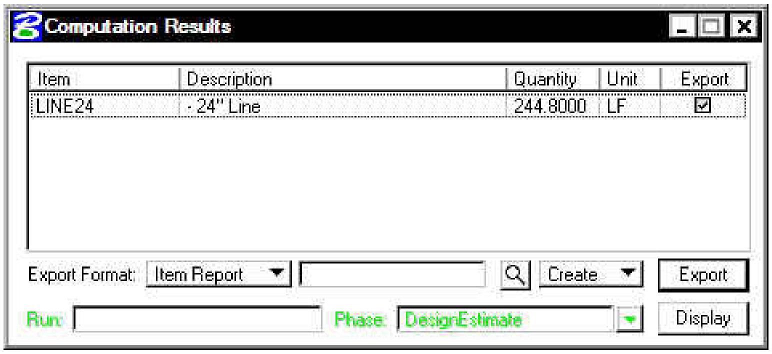
Step 12. Click item **LINE24 – 24" Line** to make it the active item for computing quantities.

Step 13. Set the supplemental dialog box as shown below then click **Compute Quantities**.


Plan Quantity Computation
Job:
Baseline Reference
Compute Quantities

Extents: View
Inside
Baseline Reference: None
☑ Hilite During Computation

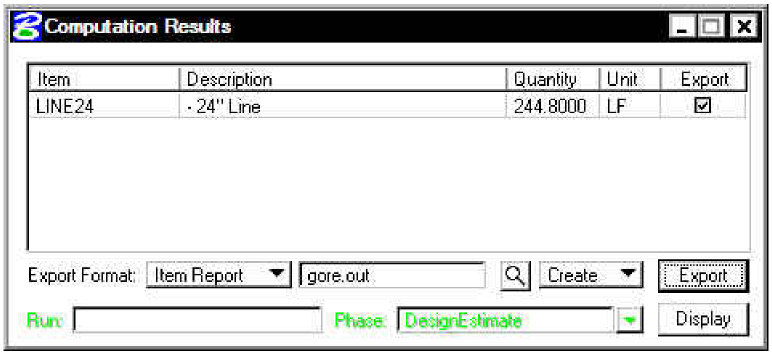
Step 14. A sample output is shown below. Your actual quantities may differ.


Computation Results
Create
Export
Run:
Display

Item	Description	Quantity	Unit	Export
LINE24	- 24" Line	244.8000	LF	☑

Export Format: Item Report
Phase: DesignEstimate

Step 15. Next we will export the quantities to an Item Report. Set the **Export Format** option to **Item Report**. Enter the output file name **gore.out**. The dialog box should appear as below.

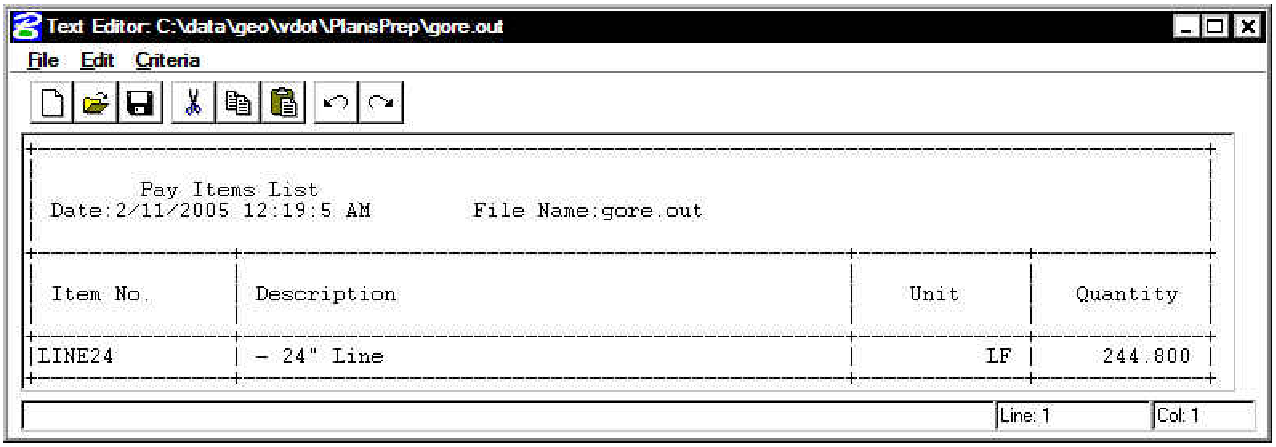

Computation Results
Create
Export
Run:
Display

Item	Description	Quantity	Unit	Export
LINE24	- 24" Line	244.8000	LF	☑

Export Format: Item Report gore.out
Phase: DesignEstimate

Step 16. Click **Export**. A file named **gore.out** should be created in the working directory.

Step 17. Open **gore.out** using the GEOPAK editor. The file should appear as below.


Text Editor: C:\data\geo\vdot\PlansPrep\gore.out
File Edit Criteria
Line: 1
Col: 1

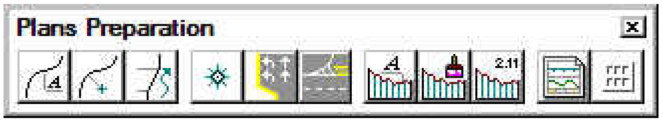
```
+-------------------------------------------------------------------------------------------+
|                                                                                           |
|        Pay Items List                                                                     |
| Date:2/11/2005 12:19:5 AM       File Name:gore.out                                        |
|                                                                                           |
+----------------+----------------------------------------------+-------------+-------------+
|                |                                              |             |             |
| Item No.       | Description                                  |    Unit     |  Quantity   |
|                |                                              |             |             |
+----------------+----------------------------------------------+-------------+-------------+
|LINE24          | - 24" Line                                   |          LF |    244.800  |
+----------------+----------------------------------------------+-------------+-------------+
```

Step 18. **Exit** MicroStation.

CHAPTER 10

Existing Ground Profiles (Optional)

10.1 Introduction

Objectives	Learn to draw and store existing ground profiles extracted from a surface model.
Project Manager	NOTE: This application is not available through Project Manager
Tools	
Menu Bar Application	GEOPAK Road > Plan Preparation > Draw Profile

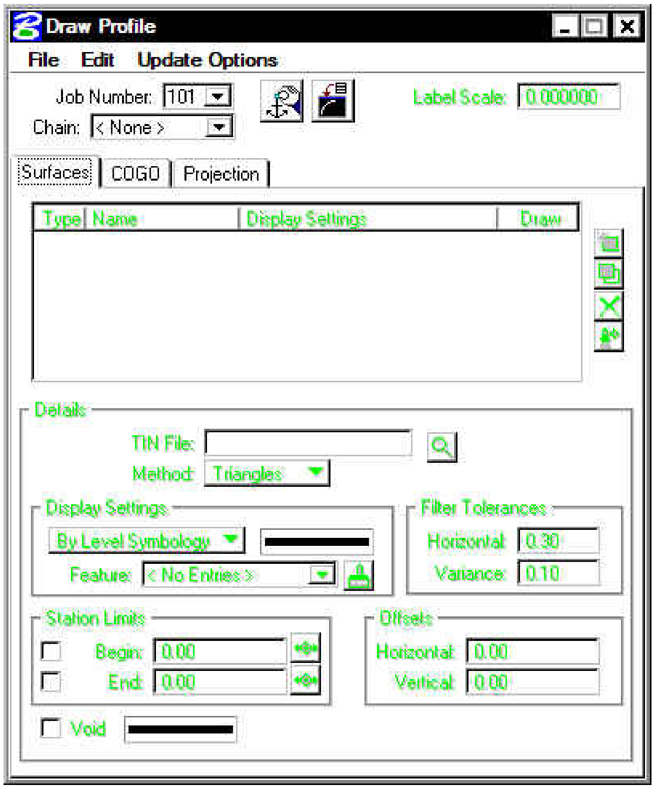
The Draw Profile tool enables the user to draw several profiles from a variety of sources simultaneously.

- GEOPAK coordinate geometry database wherein the vertical alignment is stored.
- GEOPAK binary TIN file, Site Model or Site Object. The Site Model or Object are created utilizing GEOPAK Site Modeler software and are stored within the GEOPAK Site project (gsf) file.

In addition, if the source data is TIN files or site components, the resultant profile may optionally be stored within the coordinate geometry database.

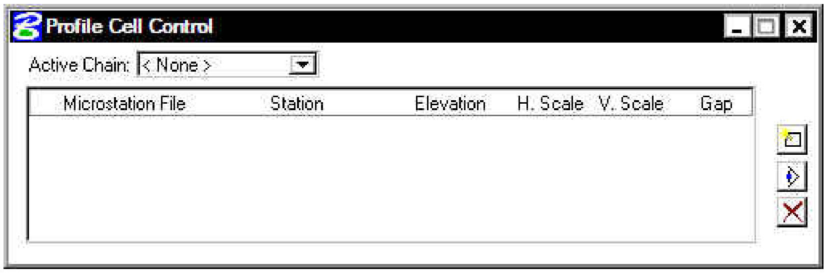
10.2 Invoking the Draw Profile Tool

The generation of profiles must be invoked from within the 2D MicroStation design file wherein the profile is to be drawn. When the tool is selected, the dialog box depicted below opens.


Draw Profile
File
Edit
Update Options
Surfaces
COGO
Projection
Type
Name
Display Settings
Draw
Details
Display Settings
Filter Tolerances
Station Limits
Offsets

Job Number: 101
Chain: < None >
Label Scale: 0.000000
TIN File:
Method: Triangles
By Level Symbology
Feature: < No Entries >
Horizontal: 0.30
Variance: 0.10
☐ Begin: 0.00
☐ End: 0.00
Horizontal: 0.00
Vertical: 0.00
☐ Void

The initial entries that are required are the **Job Number** and **Chain** name. Once selected, click the **Dialog Profile Cell Control** icon(to the right of the Job Number field). This will invoke the **Profile Cell Control** window shown below.


Profile Cell Control
Microstation File
Station
Elevation
H. Scale
V. Scale
Gap

Active Chain: < None >

Select the **Active Chain** that the new or existing profile is to be stationed along. If no profile cell exists, click the **Place Profile Cell** icon along the right side of the window to place a new cell. If multiple profile cells exist, highlight the desired cell and click the **Activate Profile Cell** icon.

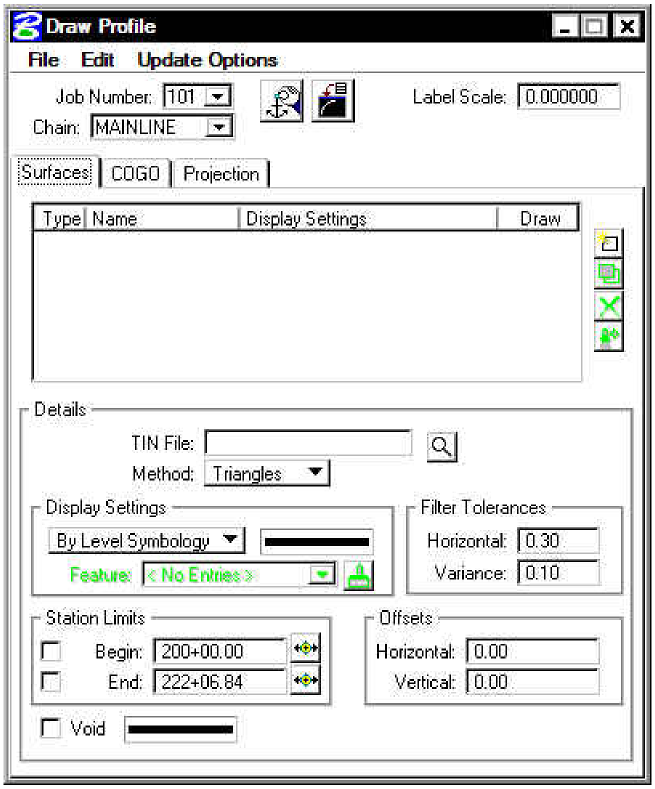
10.2.1 Update Options

Four update options exist that allow the user the control needed to tell the software what to do if a profile has been previously drawn in the file and needs updated. The options are toggled off / on by each selection of the option by clicking the **Update Options** pulldown. The check to the left of the option indicates the option is active. Only one option may be active at any given time, therefore, if an option is selected, the previous active option is de-activated. The four options are detailed in the table below.

Delete Existing Elements and Redraw	When this option is activated, any profiles previously drawn with this tool are deleted and new ground lines are drawn.
Delete Non-Modified Elements and Redraw	When this option is activated, any profiles previously drawn with this tool and not modified with any MicroStation commands are deleted and new ground lines are drawn.
Draw on Top of Existing	When this option is activated, any previously drawn profiles are ignored and a new set is drawn, resulting in multiple copies of each profile.
Query	When activated, the user is prompted each time the Draw button is pressed.

10.2.2 Surfaces Tab

The Surfaces tab defines the surfaces utilized as source data when drawing profiles. Multiple surfaces from a variety of sources can be drawn in a single processing. When the tab is selected, the dialog box dynamically changes as depicted below.



Job Number: 101
Chain: MAINLINE
Label Scale: 0.000000
TIN File:
Method: Triangles
By Level Symbology
Feature: < No Entries >
Horizontal: 0.30
Variance: 0.10
☐ Begin: 200+00.00
☐ End: 222+06.84
Horizontal: 0.00
Vertical: 0.00
☐ Void

Each surface to be drawn must be added to the list box. This is accomplished via the action / edit buttons on the right side of the dialog box. Each surface draws a cross section line string or lines. When a line is added to the list box, the profile is drawn. Note: clicking on the draw toggle in the list box deletes or redraws the profile.

To add to the list box, simply select the source data and method, Display Settings, Tolerances and Offsets, and then add the profile to the list. Once a profile is drawn, it may be updated at any time by using the **Update Profile** icon. Refer to the **Update Options** section to review those options. Any profile may optionally be stored to the GPK file if desired.

10.2.3 Display Settings

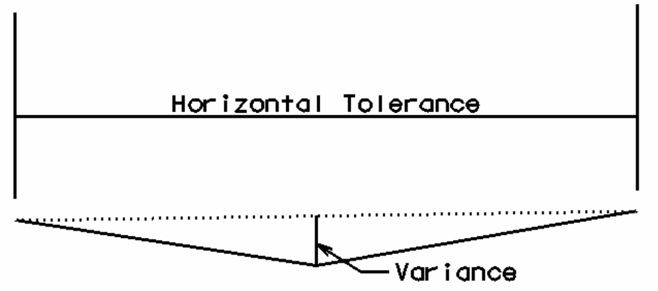
The Display Settings group box specifies the element symbology of the cross section elements being generated. The symbology may be specified using Level Symbology or a feature selected from a D&C Manager database.

To use **By Level Symbology**, set the option to By Level Symbology, then double click on the graphic. This opens the Set Feature dialog box, wherein the symbology can be specified. Click OK when completed.

To use **By Feature**, set the option to By Feature. Next, press the Paintbrush icon, which invokes the current Design and Computation Manager. Select the desired item, and then press the OK button, which closes the Design and Computation Manager, and populates the Draw Profile Display Settings group box.

10.2.4 Filter Tolerances

Both Horizontal and Variance filter tolerances are considered together for each pair of profile segments. The middle point is deleted if both segment lengths are less than the Horizontal filter tolerance while the projected distance between the mid-point and the chord between the two end points is less than the Variance tolerance.



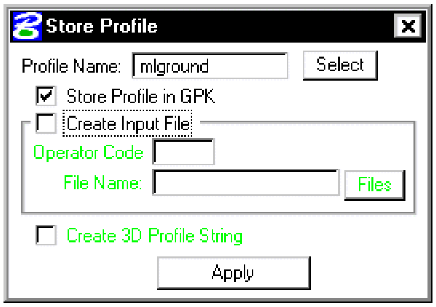
10.2.5 Offsets

Vertical or Horizontal Offsets may be specified in terms of master units (i.e., feet or meters). The **Horizontal Offset** is the distance offset from the Chain. Once the horizontal location for the profile is determined, the data source is utilized to determine the profile. Any **Vertical Offset** is applied after the profile is generated from the source data.

10.2.6 Store Profile to COGO

When the profile is drawn, it may also be stored in COGO by pressing this button, which opens the dialog box depicted below left.

The profile may be stored, or just the input file may be created. If an input file is created, the Operator Code and File Name are required. If the dialog box is invoked while in a 3D file, the user may toggle on the option to create a 3D profile string. The 3D profile string consists of the circles denoting every location where the design centerline intersects topographic elements. If the circles are not deleted at this time, they can be deleted at any time with a single application of the MicroStation "Delete Element" command.



Store Profile

Profile Name: mlground

☑ Store Profile in GPK

☐ Create Input File

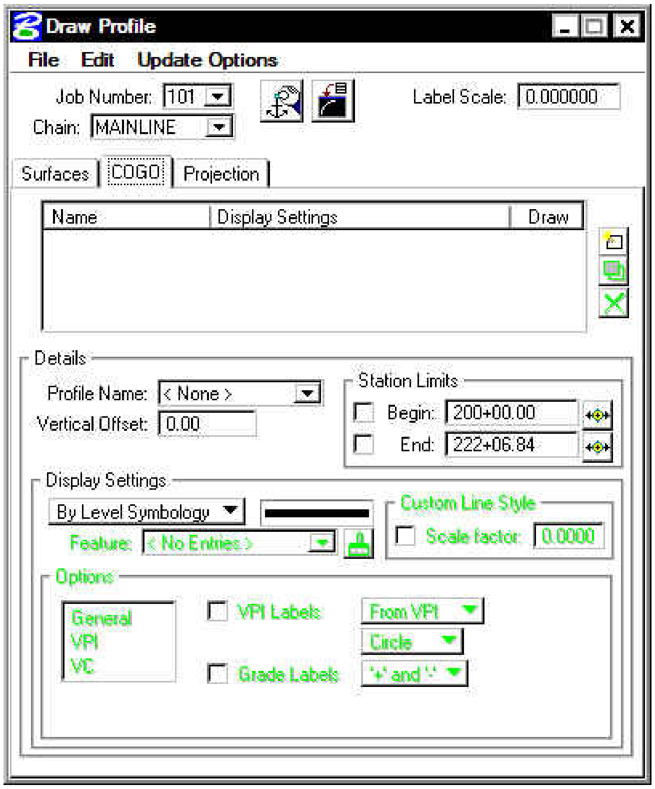
Operator Code:

File Name:

☐ Create 3D Profile String

10.2.7 Cogo Tab

The Cogo Tab is utilized for drawing any profile that has been previously stored into the GPK file.



Draw Profile

Job Number: 101

Chain: MAINLINE

Label Scale: 0.000000

Name	Display Settings	Draw

Details

Profile Name: < None >

Vertical Offset: 0.00

Station Limits

☐ Begin: 200+00.00

☐ End: 222+06.84

Display Settings

By Level Symbology

Feature: < No Entries >

Custom Line Style

☐ Scale factor: 0.0000

Options

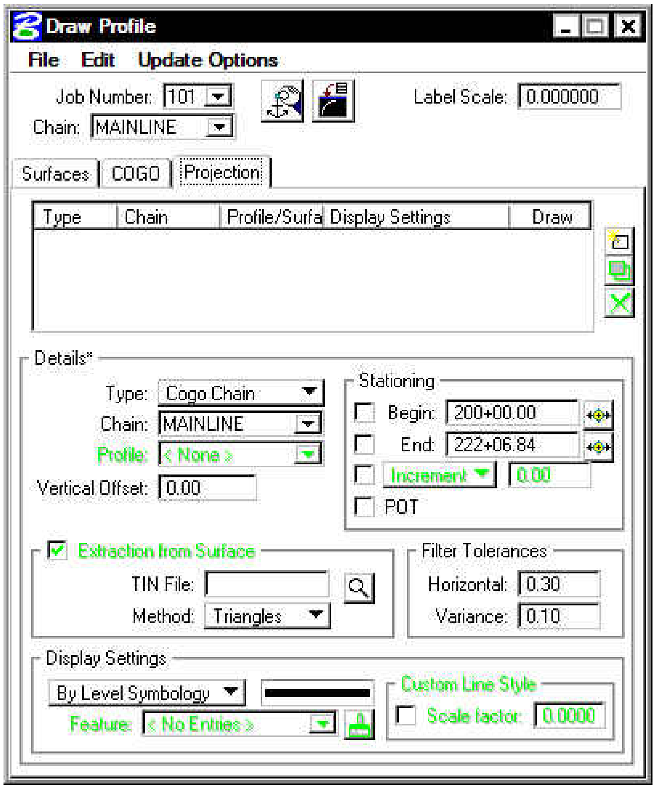
☐ VPI Labels: From VPI, Circle

☐ Grade Labels: '+' and '-'

To draw a profile, first select the **Profile Name** to be drawn. The **Vertical Offset** defaults to a value of 0, but can be set to any value. This instructs the software to draw the profile at a distance above or below the elevations in the GPK file. **Station Limits** may also be specified to have the software draw only a portion of the profile. If the **Display Settings** are set to **By Feature** and a feature is selected, the **Options** area of the dialog box is un-ghosted. This is where various labeling options for the profile can be specified. If a value is given for the **Strip Grade Increment**, elevations will be placed at that increment along the bottom of the profile.

10.2.8 Projection Tab

The Projection tab can be used when the chain / profile to be drawn is different than the chain / profile used to create the profile cell.


Draw Profile
File
Edit
Update Options
Surfaces
COGO
Projection
Type
Chain
Profile/Surfa
Display Settings
Draw
Details*
Stationing
Extraction from Surface
Filter Tolerances
Display Settings
Custom Line Style

Job Number: 101
Chain: MAINLINE
Label Scale: 0.000000

Type: Cogo Chain
Chain: MAINLINE
Profile: < None >
Vertical Offset: 0.00

☐ Begin: 200+00.00
☐ End: 222+06.84
☐ Increment 0.00
☐ POT

☑ Extraction from Surface
TIN File:
Method: Triangles

Horizontal: 0.30
Variance: 0.10

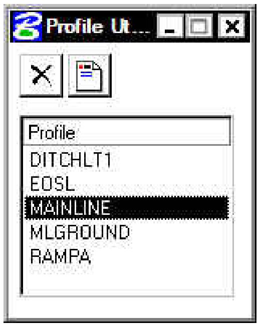
By Level Symbology
Feature: < No Entries >
☐ Scale factor: 0.0000

Each projected profile to be drawn must be added to the list box. This is accomplished via the action / edit buttons on the right side of the dialog. When a line is added to the list box, the profile is drawn. Note: Clicking on the draw toggle in the list box deletes or redraws the profile.

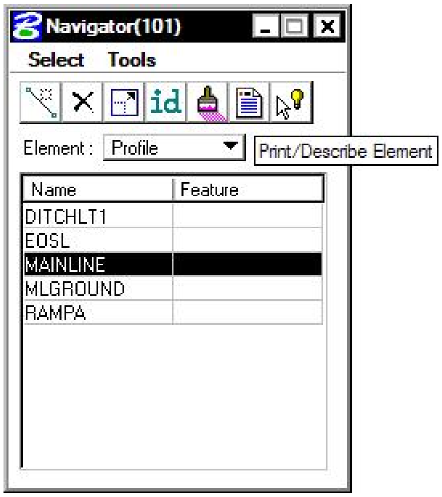
10.3 Profile Report

To review a textual report listing stations and elevations of a ground profile, open the GEOPAK Coordinate Geometry dialog box. A couple of different methods can be used to create this listing for any profile.

By selecting **Element > Profile > Utility** then highlighting a specific profile name and clicking **Print**. The results of this command will be displayed in the Command Output window of the Coordinate Geometry dialog box. To obtain a hardcopy of this information, create an output file using the **File > File Utility > Output** command and supply a filename of 1-5 characters. Then use the **File > File Utility > Print Output File** command to print this to the default system printer.

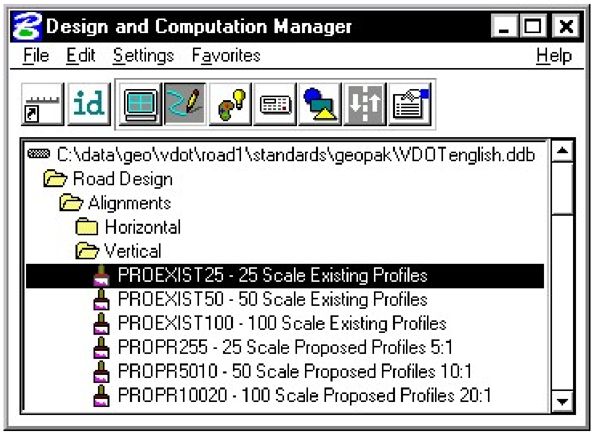

Profile Ut...
Profile
DITCHLT1
EOSL
MAINLINE
MLGROUND
RAMPA

The second method utilizes the COGO Navigator tool to create the **Print Profile** command. The advantage to this method is that multiple profiles can be identified at once and printed to the Command Output window. Start the COGO Navigator by clicking **Tools > Navigator** or selecting the icon from the COGO dialog box. Change the **Element** to **Profile** then highlight the desired profile(s). Once selected, click the **Print/Describe Element** icon on the Navigator to process the profile(s).

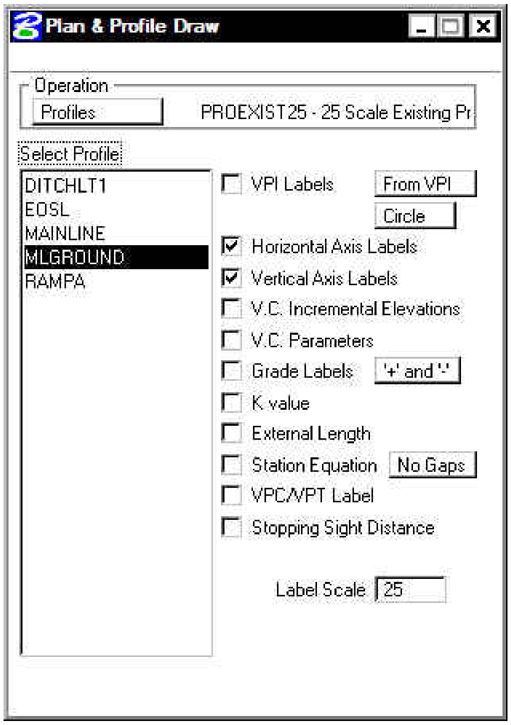

Navigator(101)
Select
Tools
Element :
Profile
Print/Describe Element
Name
Feature
DITCHLT1
EOSL
MAINLINE
MLGROUND
RAMPA

10.4 Drawing Profiles with D&C Manager

As with other COGO elements, Design and Computation Manager will be utilized to draw any type of profile into a MicroStation file: existing roadway, proposed roadway, utility, special ditch, etc. To get started, open D&C Manager then navigate to the desired item for plotting of the profile. Upon selecting an item, click on the **Draw Plan & Profile** button on the supplemental D&C dialog box.


Design and Computation Manager
File
Edit
Settings
Favorites
Help
C:\data\geo\vdot\road1\standards\geopak\VDOTenglish.ddb
Road Design
Alignments
Horizontal
Vertical
PROEXIST25 - 25 Scale Existing Profiles
PROEXIST50 - 50 Scale Existing Profiles
PROEXIST100 - 100 Scale Existing Profiles
PROPR255 - 25 Scale Proposed Profiles 5:1
PROPR5010 - 50 Scale Proposed Profiles 10:1
PROPR10020 - 100 Scale Proposed Profiles 20:1

The next dialog box that appears is the **GEOPAK Draw Plan & Profile** window, as depicted below.



Plan & Profile Draw

Operation
Profiles   PROEXIST25 - 25 Scale Existing Pr

Select Profile
DITCHLT1
EOSL
MAINLINE
MLGROUND
RAMPA

☐ VPI Labels   From VPI   Circle
☑ Horizontal Axis Labels
☑ Vertical Axis Labels
☐ V.C. Incremental Elevations
☐ V.C. Parameters
☐ Grade Labels   '+' and '-'
☐ K value
☐ External Length
☐ Station Equation   No Gaps
☐ VPC/VPT Label
☐ Stopping Sight Distance

Label Scale: 25

If it is not already selected, change the **Operation** to **Profiles**. Displayed in the window is a list of profiles currently stored in the GPK file. Along the right side of the window are labeling options for the profile that is to be plotted. Configure these as desired before selecting a profile to plot.

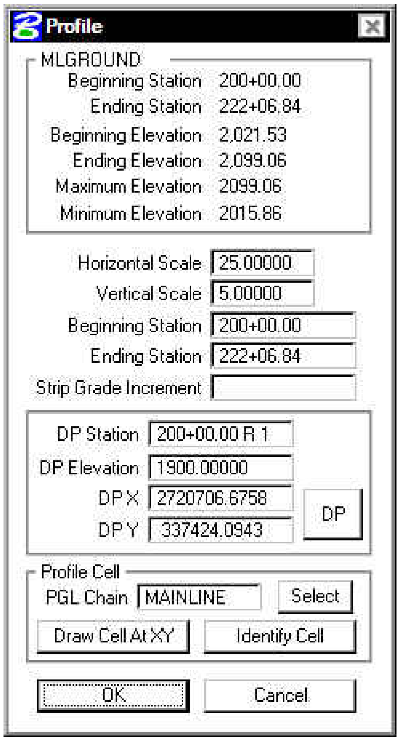
- **VPI Labels** – Labels the station and elevation of the VPI – typically turned off for plotting of existing profiles.
- **Horizontal Axis** – Places stations along the bottom of the profile.
- **Vertical Axis** – Places elevations along the left side of the profile.
- **VC Parameters** – Labels the length of the vertical curve if applicable.
- **VPC/VPT Labels** – Annotates the station and elevation of a vertical curves control points.
- **Stopping Sight Distance** – Places text for crest vertical curves representing the curves stopping sight distance as defined by AASHTO.

After selecting a profile to plot, the dialog box below opens. Since a profile does not have XY coordinates, the user must specify a location in the MicroStation file to place the profile and a scale at which to plot the profile. When using a ratio other than 1:1, the horizontal dimensions of the profile remain true and the vertical is exaggerated.

The location can be selected by clicking on the **DP** button then specifying a location in the file by issuing a data point in the view. The coordinates can also be keyed in to the dialog box. A **Profile Cell** can be drawn into the file to represent the location of the data point and associated information. This cell can be used in any other GEOPAK tool that needs to know the location of the profile. A PGL Chain must be selected before drawing the profile cell. This chain will be the chain that the profile is stationed along.

If a value is specified for the **Strip Grade Increment**, elevations will be calculated at the desired interval along the profile and placed just above the **Horizontal Axis Labels** (stations).

Click **OK** to draw the profile.



MLGROUND

Beginning Station	200+00.00
Ending Station	222+06.84
Beginning Elevation	2,021.53
Ending Elevation	2,099.06
Maximum Elevation	2099.06
Minimum Elevation	2015.86

Horizontal Scale	25.00000
Vertical Scale	5.00000
Beginning Station	200+00.00
Ending Station	222+06.84
Strip Grade Increment	

DP Station	200+00.00 R 1
DP Elevation	1900.00000
DP X	2720706.6758
DP Y	337424.0943

Profile Cell

PGL Chain MAINLINE

LAB 10: Existing Ground Profiles

In this exercise, existing ground profiles will be drawn representing the centerline of chain **MAINLINE**.

10.1 Draw Existing Ground Centerline Profile

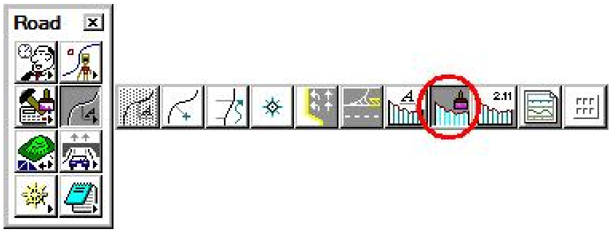
Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB10.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682prof.dgn**

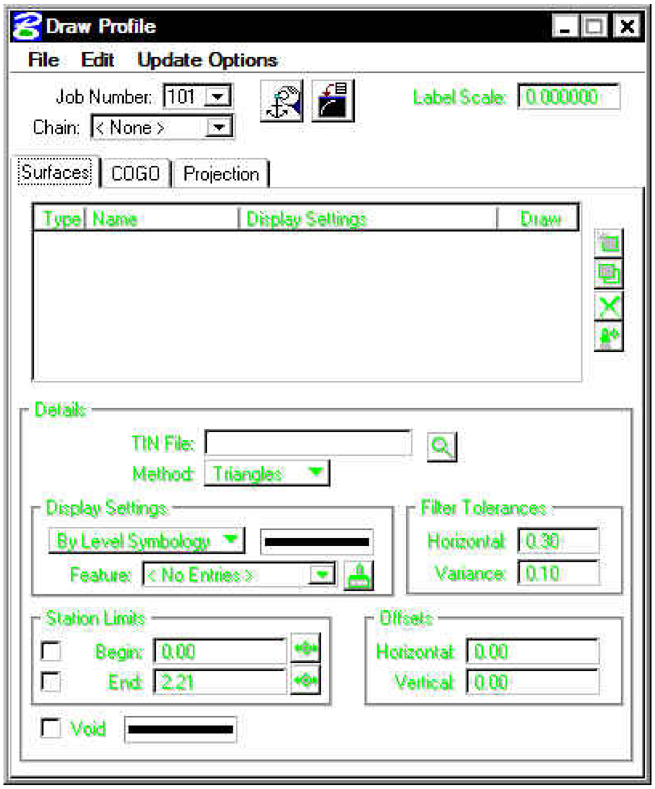
Access **Project Manager**. It should automatically access the Road workflow dialog box since we "remembered" the options in Exercise 2.

Step 3. The file *d17682des.dgn* should be attached as a reference.

Step 4. Select the **Draw Profile** tool from the Road Tools palette.



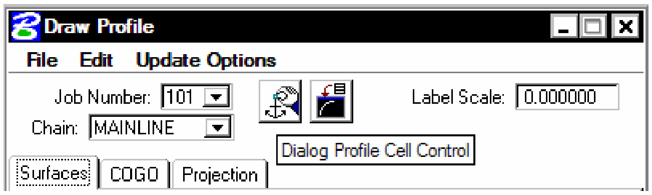
The dialog box below will open.


Draw Profile
File
Edit
Update Options
Surfaces
COGO
Projection
Type
Name
Display Settings
Draw
Details
Display Settings
Filter Tolerances
Station Limits
Offsets

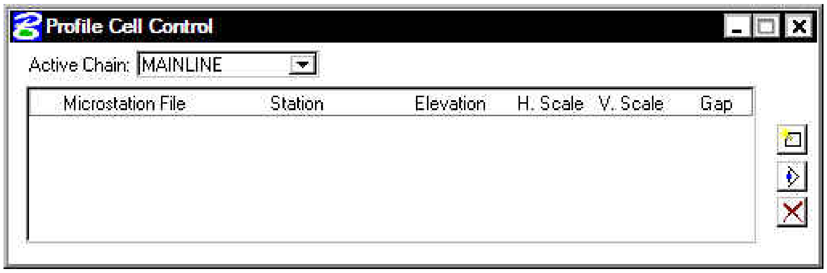
Job Number: 101
Chain: < None >
Label Scale: 0.000000
TIN File:
Method: Triangles
By Level Symbology
Feature: < No Entries >
Horizontal: 0.30
Variance: 0.10
☐ Begin: 0.00
☐ End: 2.21
Horizontal: 0.00
Vertical: 0.00
☐ Void

Step 5. Select chain **MAINLINE**.

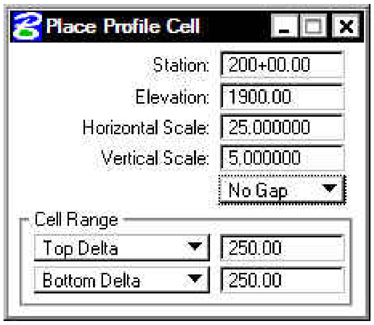
Step 6. Click the Dialog Profile Cell Control icon (to the right of Job Number).


Draw Profile
File
Edit
Update Options
Job Number:
101
Chain:
MAINLINE
Label Scale:
0.000000
Dialog Profile Cell Control
Surfaces
COGO
Projection

Set the **Active Chain** to MAINLINE.


Profile Cell Control
Active Chain:
MAINLINE
Microstation File
Station
Elevation
H. Scale
V. Scale
Gap

Step 7. Click the **Place Profile Cell** icon on the right side of the dialog box. This will open the Place Profile Cell dialog box.


Place Profile Cell

Station: 200+00.00

Elevation: 1900.00

Horizontal Scale: 25.000000

Vertical Scale: 5.000000

No Gap

Cell Range

Top Delta: 250.00

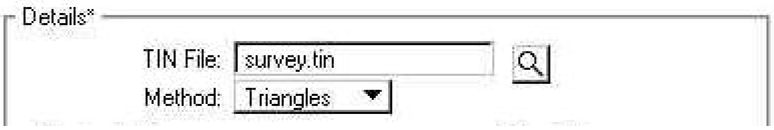
Bottom Delta: 250.00

Step 8. Fill the dialog box out as shown above and then DP somewhere to the right of the plan view reference file in order to place the profile cell into the design file.

Fit the view contents.

Close the **Profile Cell Control** dialog box.

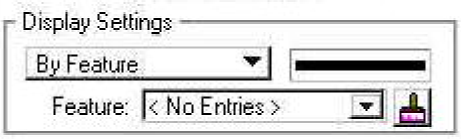
Step 9. From the Surfaces tab, select the folder icon in the **Details** area, then select the SURVEY.TIN file for the **TIN File** to cut the profile. Set the **Method** to **Triangles**. This instructs the software to compute elevations at each location that the chain intersects a triangle leg from the TIN.



TIN File: survey.tin

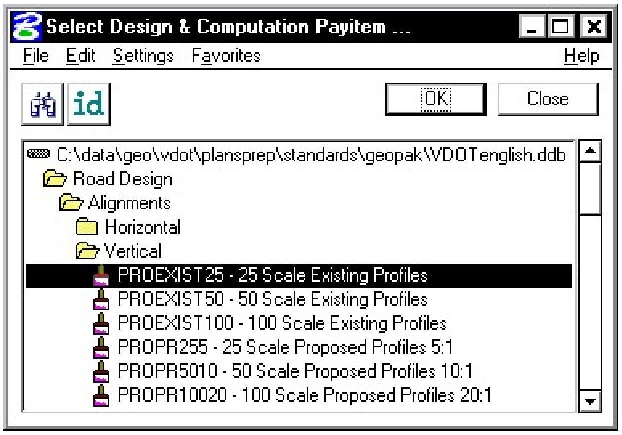
Method: Triangles

Step 10. Use **By Feature** mode in the **Display Settings** area of the dialog box. Click the **Paintbrush** icon and select the item shown below.


Display Settings

By Feature

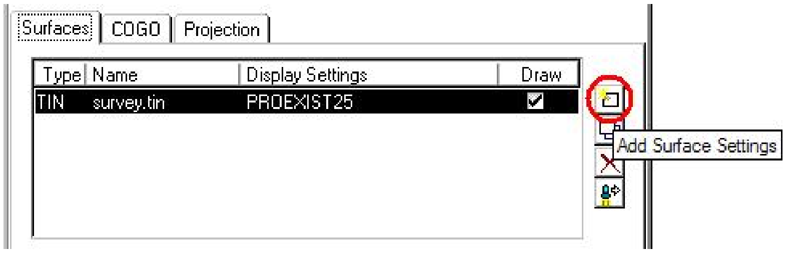
Feature: < No Entries >


Select Design & Computation Payitem ...
File
Edit
Settings
Favorites
Help
id
OK
Close

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
  - Alignments
    - Horizontal
    - Vertical
      - PROEXIST25 - 25 Scale Existing Profiles
      - PROEXIST50 - 50 Scale Existing Profiles
      - PROEXIST100 - 100 Scale Existing Profiles
      - PROPR255 - 25 Scale Proposed Profiles 5:1
      - PROPR5010 - 50 Scale Proposed Profiles 10:1
      - PROPR10020 - 100 Scale Proposed Profiles 20:1

Press **OK**.

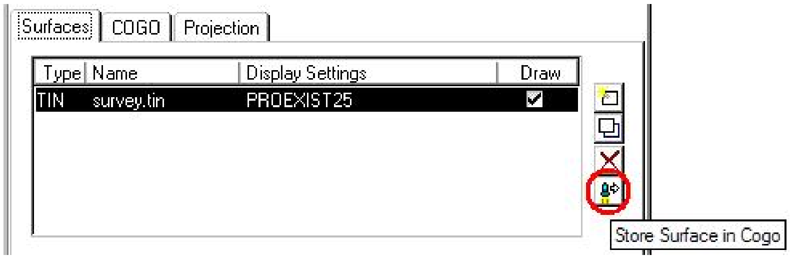
Step 11. Click the **Add Surface Settings** icon to add the profile to the list box as well as draw the profile into the Microstation file.


Surfaces
COGO
Projection
Add Surface Settings

Type	Name	Display Settings	Draw
TIN	survey.tin	PROEXIST25	☑

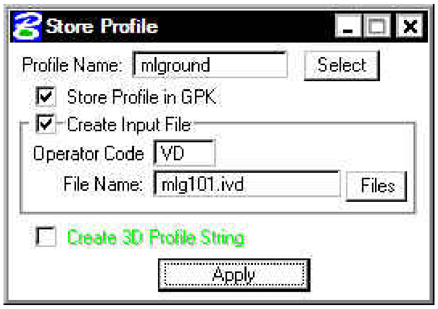
10.2 Store Profiles into COGO Database

Step 1. Click the **Store Surface in COGO** icon.


Surfaces
COGO
Projection
Store Surface in Cogo

Type	Name	Display Settings	Draw
TIN	survey.tin	PROEXIST25	☑

This will invoke the **Store Profile** dialog box.


Store Profile
Select
Files
Apply

Profile Name: mlground

☑ Store Profile in GPK

☑ Create Input File

Operator Code: VD

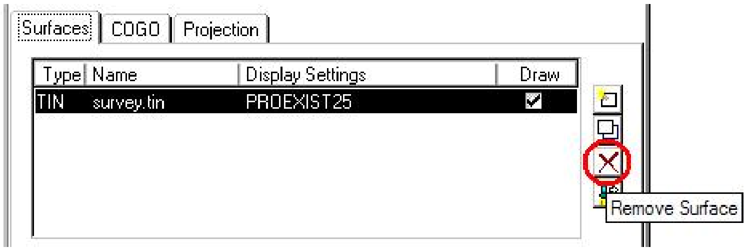
File Name: mlg101.ivd

☐ Create 3D Profile String

Step 2. Fill out the dialog box as shown above and click **Apply**. '**MLG101.ivd**' will be created in the working directory. This file will contain the COGO commands used to create the existing ground profile.

Step 3. Dismiss the **Store Profile** dialog box by clicking the **X** in the upper right hand corner.

Step 4. Click the **Remove Surface** icon. This will erase the profile from the DGN file. We will re-draw the profile shortly.

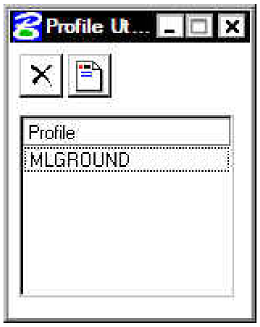

Surfaces
COGO
Projection
Remove Surface

Type	Name	Display Settings	Draw
TIN	survey.tin	PROEXIST25	☑

10.3 Review Profiles in COGO

Step 1. Access the coordinate geometry tool. (Press the **Coordinate Geometry** button on the workflow dialog box). This will open the Coordinate Geometry dialog box.

Step 2. Select **Element > Profile > Utility** from the COGO menu bar to invoke the **Profile Utility** dialog box.



Step 3. Select the profile **'MLGROUND'** then click the **Print** icon.

Step 4. Review the profile information in the COGO output display window.

Step 5. Close the Coordinate Geometry dialog box (use X in upper right corner of the dialog box). When prompted to save the COGO session select NO.

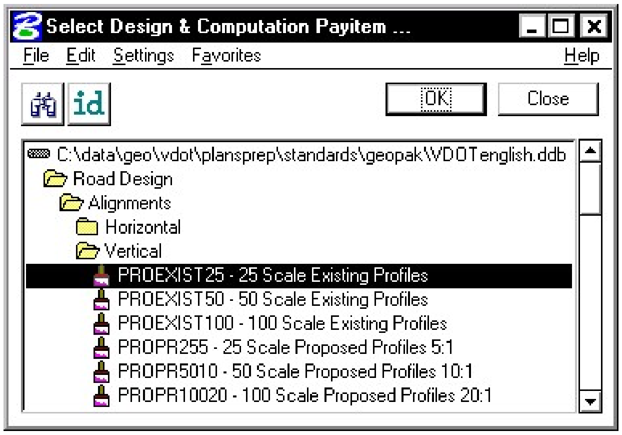
10.4 Drawing & Labeling the Existing Centerline Profile

Next, we are drawing and labeling the existing profile utilizing the Draw Profile tool's **COGO** tab.

Step 1. Click the **COGO** tab and set the **Label Scale** to **25** in the upper right hand corner.

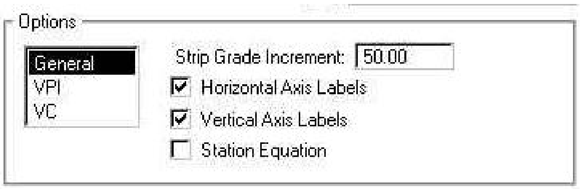
Step 2. Select Profile Name **MLGROUND** from the drop down list in the Details area.

Step 3. Under the **Display Settings** set the option to **By Feature**. Select the feature shown below and click OK.



C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
  - Alignments
    - Horizontal
    - Vertical
      - PROEXIST25 - 25 Scale Existing Profiles
      - PROEXIST50 - 50 Scale Existing Profiles
      - PROEXIST100 - 100 Scale Existing Profiles
      - PROPR255 - 25 Scale Proposed Profiles 5:1
      - PROPR5010 - 50 Scale Proposed Profiles 10:1
      - PROPR10020 - 100 Scale Proposed Profiles 20:1

Step 4. Click **General** in the **Options** area and set the **Strip Grade Increment to 50**. This will label the elevations every 50' along the bottom of the profile area.



Strip Grade Increment: 50.00

☑ Horizontal Axis Labels

☑ Vertical Axis Labels

☐ Station Equation

Step 5. Click the **Add Cogo Profile Settings** icon to draw the profile. This will draw the existing ground profile with the proper symbology in addition to labeling the stations and elevations along the bottom of the profile and the elevations along the left side of the profile.

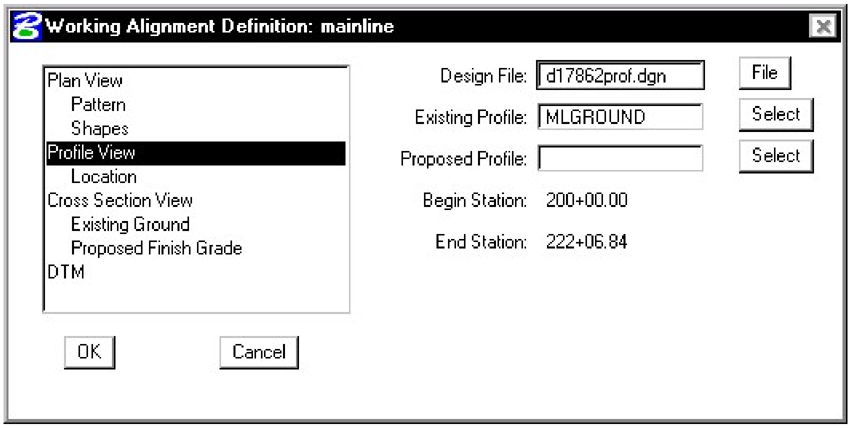
Step 6. Dismiss the **Draw Profile** dialog box by clicking the **X** in the upper right hand corner.

10.5 Project Manager - Define

We are completing the Profile View and Location sections of the Working Alignment Definition in Project Manager.

Step 1. From the Workflow dialog box of Project Manager, press the **Define** button.

Step 2. Highlight the **Profile View** option and populate the dialog box as depicted below.


Working Alignment Definition: mainline
Plan View
Pattern
Shapes
Profile View
Location
Cross Section View
Existing Ground
Proposed Finish Grade
DTM
File
Select
Select
OK
Cancel

Design File: d17862prof.dgn

Existing Profile: MLGROUND

Proposed Profile:

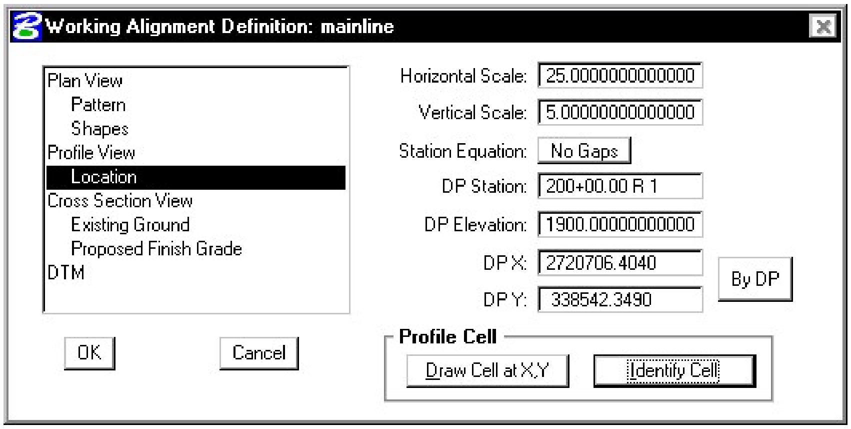
Begin Station: 200+00.00

End Station: 222+06.84

We have not designed the proposed profile; therefore, we will return to populate this field in a later exercise.

Step 3. Highlight the **Location** option. To quickly populate this category within working alignment, click **Identify Cell**, then data point on the cell for the centerline profile in the file and accept.

Note: Your coordinates may be different than those shown below. That is not a problem.


Working Alignment Definition: mainline
Plan View
Pattern
Shapes
Profile View
Location
Cross Section View
Existing Ground
Proposed Finish Grade
DTM
By DP
Profile Cell
Draw Cell at X,Y
Identify Cell
OK
Cancel

Horizontal Scale: 25.0000000000000

Vertical Scale: 5.00000000000000

Station Equation: No Gaps

DP Station: 200+00.00 R 1

DP Elevation: 1900.00000000000

DP X: 2720706.4040

DP Y: 338542.3490

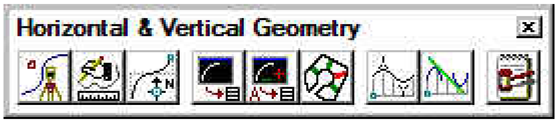
Step 4. Press the **OK** button to save the updates and close the dialog box.

Step 5. **Exit** MicroStation.

CHAPTER 11

Vertical Alignment Generators (Optional)

11.1 Introduction

Objectives	To create and store vertical alignments using the **Vertical Alignment Generator**.
Project Manager	Vertical Alignment
Tools	
Menu Bar Application	GEOPAK Road > Geometry > Layout Profiles (VPI Based) GEOPAK Road > Geometry > Layout Profiles (Component Based)

GEOPAK has a variety of tools for generating and storing a proposed profile. Those tools include:

- The **Vertical Alignment Generator (VPI Based)** is a GEOPAK tool that can graphically create and modify proposed design profiles or modify an existing ground profile. The designer can generate a profile based on VPI data, design speeds, stopping sight distances, and K values. These operations may be accomplished through a dialog box and/or by dynamic manipulation of graphic elements.
- The **Component Based Vertical Alignment** tools provide the user with a myriad of tools to place, modify and delete profile components. Tool boxes organize tools to include the placement of tangent lines, a variety of vertical curves. Components interact with each other to automatically trim vertical curves, connect various elements, and modify, copy and rotate components. The user also has the option to store completed profiles in the coordinate geometry database.
- A profile may also be created with Coordinate Geometry (COGO) input (key in commands). In addition, there are VC commands that compute and display vertical geometry and the parameters associated to aid in the development and generation of vertical alignments used in conjunction with Store Profile commands. VC commands define parabolas for various combinations of stations, elevations, grades, slopes and the rate of vertical curvature (K value), and also define the tangents between two parabolas or between a parabola and a point.

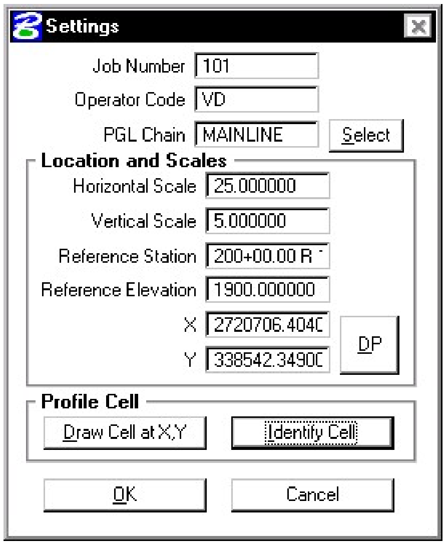
This chapter focuses on the two graphical based tools - **Vertical Alignment Generator** and **Component Based Vertical Alignment.**

11.2 Vertical Alignment Generator

11.2.1 Accessing

When selecting the Vertical Alignment generator, the first dialog box that appears is labeled **Settings**, as depicted here. The entries in this box set the parameters and define the location within the design file where the profile components are to be displayed. All fields must be completed before the design process can begin. Once the **OK** button is pushed, the Vertical Profile Generator dialog box appears.

Note: This tool also utilizes the cell that was drawn in the previous exercise by using the **Identify Cell** button..



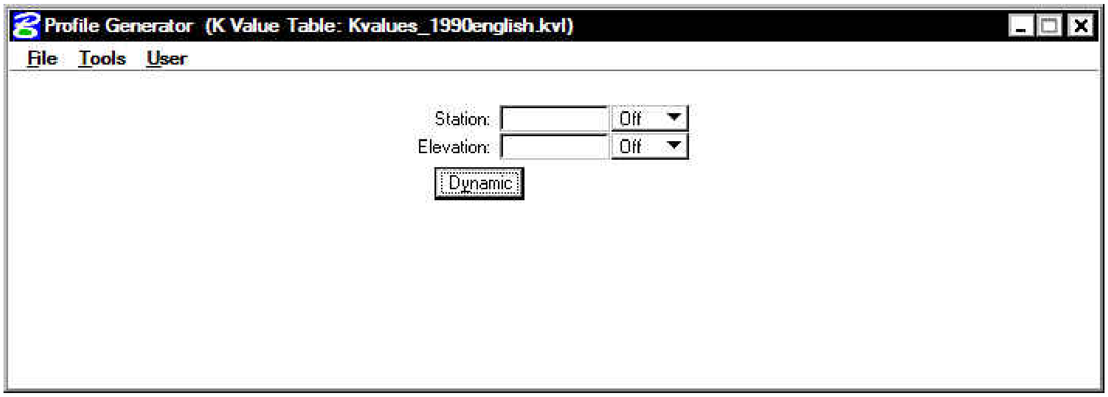
Settings

Job Number: 101
Operator Code: VD
PGL Chain: MAINLINE

Location and Scales
Horizontal Scale: 25.000000
Vertical Scale: 5.000000
Reference Station: 200+00.00 R
Reference Elevation: 1900.000000
X: 2720706.404C
Y: 338542.3490C

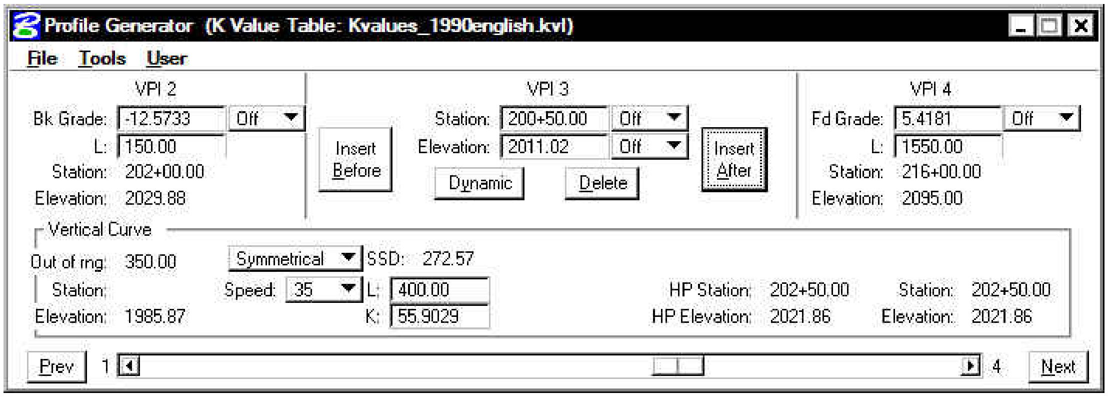
11.2.2 Using the Vertical Alignment Generator

This tool enables a user to load a previously stored profile or create a new profile. You will notice the dynamic changes in the dialog box throughout the vertical alignment design.



Profile Generator (K Value Table: Kvalues_1990english.kvl)

Station: Off
Elevation: Off



Profile Generator (K Value Table: Kvalues_1990english.kvl)

VPI 2
Bk Grade: -12.5733 Off
L: 150.00
Station: 202+00.00
Elevation: 2029.88

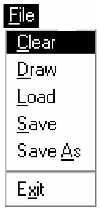
VPI 3
Station: 200+50.00 Off
Elevation: 2011.02 Off

VPI 4
Fd Grade: 5.4181 Off
L: 1550.00
Station: 216+00.00
Elevation: 2095.00

Vertical Curve
Out of rng: 350.00
Station:
Elevation: 1985.87
Symmetrical
Speed: 35
SSD: 272.57
L: 400.00
K: 55.9029
HP Station: 202+50.00
HP Elevation: 2021.86
Station: 202+50.00
Elevation: 2021.86

Various design parameters must be defined prior to designing a new profile; which are discussed in the options supported under the three menu options; **File**, **Tools**, and **User**.

11.2.3.1 File



Clear - clears the profile display from MicroStation graphics and removes all VPI's from the dialog box.

Draw - write the graphic elements of the profile to the MicroStation file.

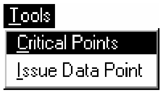
Load - retrieves a previously stored profile from the coordinate geometry database (.gpk)

Save - stores a new profile or updates (redefines) a previously stored profile under the same name.

Save As - is used to store the profile or to save a modified profile under a different name.

Exit - ends the process.

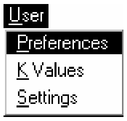
11.2.3.2 Tools



Critical Points - Vertical curves may also be defined by one or two critical points – i.e. the curve will pass through these points If mathematically solvable, the vertical curve will be drawn and the design speed display adjusted to fit the current parameters.

Issue Data Point - Permits the user to type in stations and elevations, issue a data point that can be part of a MicroStation place line, place a cell or perform other generic operations. This is useful in displaying visual references within the profile that need to be considered in design of the vertical profile.

11.2.3.3 User



Preferences - sets the rounding parameters for each of the items listed in the dialog box. Also contains a toggle that will force the dialog box to window center the view on the current VPI.

K Values - is a table of stopping sight distance K-values for crest and sag conditions for various design speeds. These values are based on the AASHTO Green Book.

Settings - recalls the **Settings** dialog box that first appeared upon initializing Vertical Layout.

11.2.4 Creating A New Profile

The enter/tab key must be used to ensure values are accepted.

A new profile can be created with the following steps:

Step 1. Place the first VPI using one of the four supported options.

- Type station and elevation of the VPI into the appropriate fields in the Profile Generator dialog box.
- Enter station of VPI as precision input (type in value), and allow the elevation to be defined through dynamic cursor placement on screen.
- Elevation is defined via precision input, and the station is defined through dynamic cursor placement on screen.
- Both values for the VPI can be established dynamically on screen by clicking on the **Dynamic** button and placing a DP in the view at the desired station and elevation.

Step 2. Define ahead (or back tangent)

Station, elevation, grade and length parameters may be defined via precision input, dynamic manipulation or a combination of both.

Step 3. Define remaining VPI’s and Grades

A repetition of Step 2 with an option to insert VPI’s between two existing VPI’ s.

Step 4. Define Vertical Curves

Simply define the design speed from the Speed option button and GEOPAK will reference the K-value table and draw the vertical curve. If a *curve overlap* occurs, an overlap message will be displayed in the dialog box along with the overlap length. Length of Curve or K-value may also be keyed in.

Step 5. Adjusting Curve Lengths

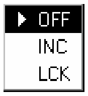
The vertical curve can be modified by directly keying in either the K-value, curve length or defining the design speed in the dialog box. You will see the values computed automatically adjust to reflect the results of any modifications.

Step 6. Save the Profile

Click **File > Save As** to name and save the newly created profile. The names of profiles are any 1-9 alphanumeric characters.

11.2.5 Precision Placement Options

Options available for creating or modifying vertical curves, VPI's and grade lines:



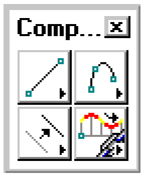
- **OFF** - Values change.
- **INC** (Increment) - Ensures that the designated profile parameter will be adjusted as defined in the Preferences dialog box.
- **LCK** (Locked) - Forces selected operations to maintain the designated profile parameters.

11.3 Component Based Vertical Alignment

This tool requires COGO and the active chain control to be active. If a COGO session in not open, an Alert message is displayed.

11.3.1 Accessing

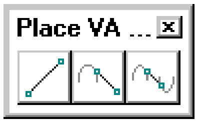
When the tool is selected, the tool frame illustrated below opens.



The 2x2 tool frame is similar to the MicroStation main tool frame. It is not resizable, but dockable. Each icon in the tool frame is a tool box that one can "tear off" to become a "tool box." The individual tool boxes can be docked and resized. There are four tool boxes, with the following titles:

- Place Vertical Alignment Lines
- Place Vertical Alignment Curves
- Profile Tools
- Manipulate Vertical Alignment Elements

11.3.2 Place Vertical Alignment Lines



The **Place Vertical Alignment Lines** tools are detailed in the table below.

Create a Profile Line by Two Points

This tool enables the user to place a profile line by defining two points. Optionally the slope or length of the line may be fixed.

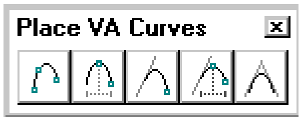
Create a Profile Line Tangent to One Element

This tool enables the user to place a profile line tangent to a curve.

Create a Profile Line Tangent to Two Elements

This tool enables the user to create a Vertical Alignment line tangent to two curves.

11.3.3. Place Vertical Alignment Curves



The **Place Vertical Alignment Curves** tools are detailed in the table below.

Place a Vertical Curve by Three Points

This tool enables the user to place a profile curve by three points.

Place a Vertical Curve by High Point

This tool enables the user to place a vertical curve by defining a high point (or in the case of a sag curve, the low point).

Place a Vertical Curve Tangent to One Element and Through One Point

This tool enables the user to place a profile curve tangent to one element (line or curve) and defining a pass through point.

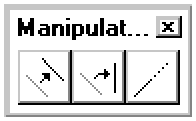
Place a Vertical Curve Tangent to One Element Given High Point

This tool enables the user to place a profile curve tangent to one element and defining a high point or low point.

Place a Vertical Curve Tangent to Two Elements

This tool enables the user to place a profile curve tangent to two elements (any combination of lines and curves).

11.3.4 Manipulate Vertical Alignment Elements



The **Manipulate Vertical Alignment Elements** tools are detailed in the table below.

Move a Profile View Element

This tool enables the user to move an element or to make copies. Note the moved or copied element must remain within the confines of the profile cell and associated delta top and bottom values.

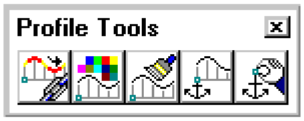
Rotate a Profile View Element

This tool rotates the selected tangent about a user-defined point.

Extend a Profile View Element

This tool can extend or shorten any Vertical Alignment element, either tangent or vertical curve.

11.3.5 Profile Tools



The **Profile Tools** tools are detailed in the table below.

Store a Vertical Alignment in COGO

This tool enables the user to store graphical profile components (lines and curves) into coordinate geometry.

Graphical Profile Preferences

This tool enables the user to define the preferences utilized within the Component Based Profile Generator such as the profile element symbologies and the profile name prefix.

Import Vertical Alignment from COGO

This tool enables the user to import (draw) a previously stored profile from the coordinate geometry database.

Place Profile Cell Anchor

This tool enables the user to place the profile required as a prerequisite to any profile creation. Note the profile cell may be placed by many other applications in GEOPAK, i.e., D&C Manager, Vertical Alignment Generator, Project Manager and Plan / Profile Sheets.

Profile Cell Control

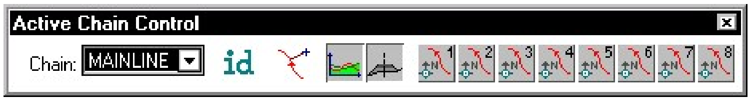
The Profile Cell Control dialog box enables the user to place or manipulate profile cells and associated data.

11.4 Active Chain Control

The GEOPAK Active Chain Control is an excellent tool, enabling the user to manage plan, profile, and cross section views simultaneously. It also allows usage of MicroStation tools to place elements in any view in accordance with the curvilinear coordinates settings.

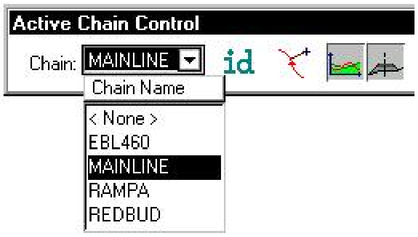
The Active Chain Control requires COGO to be running. If the tool is selected without COGO activated, the Chain list is empty. In addition, the files must be referenced (i.e., plan, cross section, and profile) before utilizing the tool.

When invoked, the dialog box depicted below opens.



Chain: MAINLINE

First, select the desired chain from the Chain list box at the left end of the tool box, as depicted below. This list is updated each time a chain is created/deleted or a new GPK file is opened.

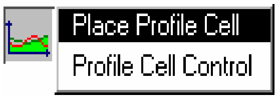


Four icons are supported to the right of the chain list field and are detailed in the table below.

Graphically select the active chain candidate.

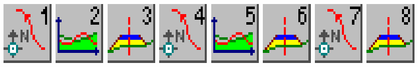
Opens the "Precise Curvilinear Coordinates" dialog box, that allows entering precise curvilinear coordinates relative to the active chain.

Activates the current Profile system, which is associated to a Profile Cell. The Profile Cell can stay in the master file or in any of the reference files. If there are several Profile cells relative to the active chain, it is possible to designate the active one in the Profile Cell Control dialog box. When the right button is pressed, a pop-up menu appears :



The first option of the pop-up menu allows placing a Profile cell. The second option allows getting information about Profile cells that stays in master and reference files and select the active one if there are several profile cells.

Activates the current Cross Section system. If there are several reference files containing XS cells relative to the active chain, it is not possible to activate the Cross Section Representation System. In this case, an alert dialog box is displayed.



The right side of the toolbox has eight icons, which set each view to plan, profile or cross section view. By right clicking an icon, any view can be set to any of the 3 possible views. For example, if there is an active profile cell, setting a view to profile will immediately fit the profile within the limits of the view.

LAB 11: Proposed Profiles

11.1 Generate the Proposed Profile

Step 1. Execute

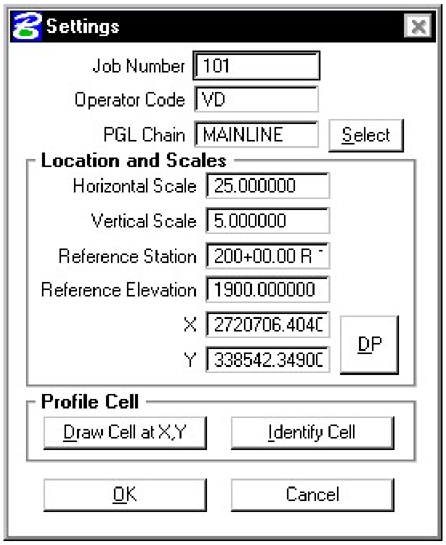
C:\data\geo\VDOT\PlansPrep\LAB11.EXE.

Step 2. Open the MicroStation file:

C:\data\geo\VDOT\PlansPrep\d17682prof.dgn

Access Project Manager. It should automatically access the Road workflow dialog box since we "remembered" the options in Exercise 2.

Step 3. Select the Vertical Alignment button from the Road Project: **17682**.prj workflow dialog box.

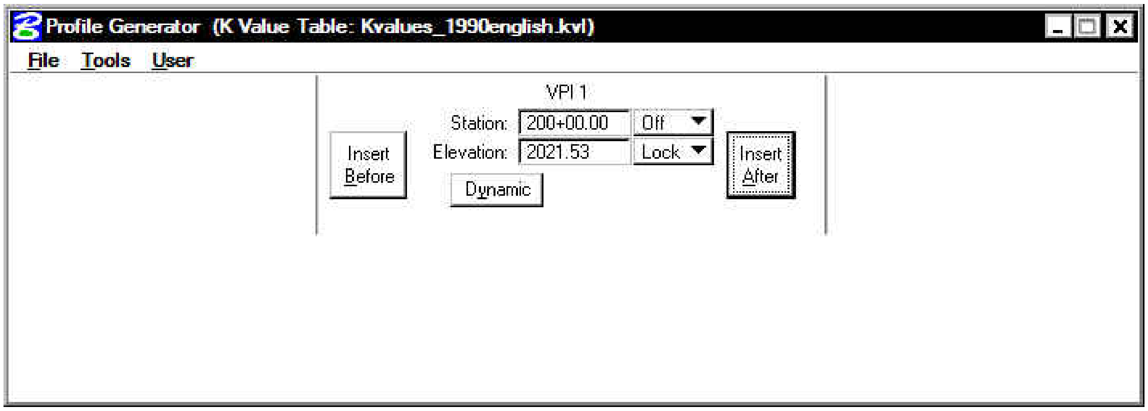

Settings
Location and Scales
DP
Select
Profile Cell
Draw Cell at X,Y
Identify Cell
OK
Cancel

Job Number: 101
Operator Code: VD
PGL Chain: MAINLINE
Horizontal Scale: 25.000000
Vertical Scale: 5.000000
Reference Station: 200+00.00 R
Reference Elevation: 1900.000000
X: 2720706.404
Y: 338542.349

Step 4. All of the information in the invoked Settings dialog box should be automatically populated based upon the information we provided in the DEFINE dialog box in Exercise 8.

Step 5. Press the **OK** button to commence development of the proposed profile.

Step 6. Provide the initial VPI Station = **200+00** and the initial VPI Elevation = **2021.53** as shown in the diagram below. Be sure to press Enter after each entry is made.

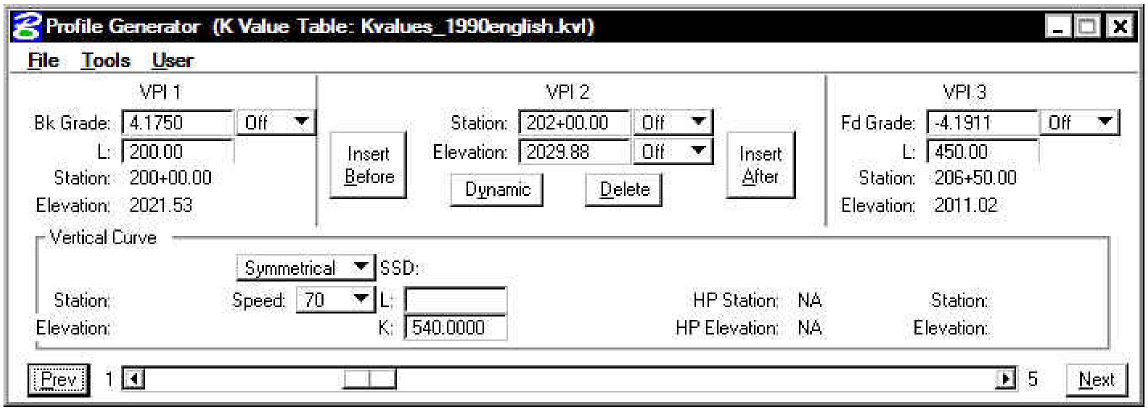

Profile Generator (K Value Table: Kvalues_1990english.kvl)
File
Tools
User
VPI 1
Insert Before
Dynamic
Insert After

Station: 200+00.00 Off
Elevation: 2021.53 Lock

Step 7. Press the **Insert After** button and complete the VPI Station and Elevation of the subsequent VPIs as detailed in the table below.

VPI	Station	Elevation
2	202+00	2029.88
3	206+50	2011.02
4	216+00	2095.00
5	222+00	2099.00

Step 8. Press the **Prev** button to return to **VPI 2** as shown in the diagram below.



Profile Generator (K Value Table: Kvalues_1990english.kvl)

VPI 1
Bk Grade: 4.1750 Off
L: 200.00
Station: 200+00.00
Elevation: 2021.53

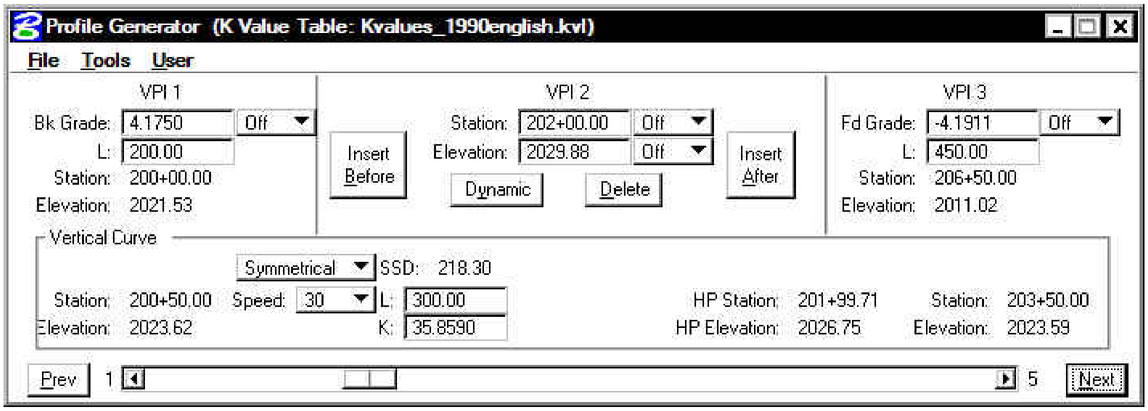
VPI 2
Station: 202+00.00 Off
Elevation: 2029.88 Off

VPI 3
Fd Grade: -4.1911 Off
L: 450.00
Station: 206+50.00
Elevation: 2011.02

Vertical Curve
Symmetrical SSD:
Station:
Speed: 70 L:
Elevation:
K: 540.0000
HP Station: NA
HP Elevation: NA
Station:
Elevation:

1 5

Step 9. Enter a symmetrical vertical curve Length of **300**. (The K value and Design Speed are automatically computed.)



Profile Generator (K Value Table: Kvalues_1990english.kvl)

VPI 1
Bk Grade: 4.1750 Off
L: 200.00
Station: 200+00.00
Elevation: 2021.53

VPI 2
Station: 202+00.00 Off
Elevation: 2029.88 Off

VPI 3
Fd Grade: -4.1911 Off
L: 450.00
Station: 206+50.00
Elevation: 2011.02

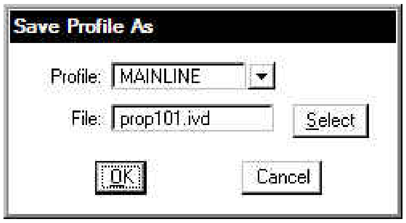
Vertical Curve
Symmetrical SSD: 218.30
Station: 200+50.00
Speed: 30 L: 300.00
Elevation: 2023.62
K: 35.8590
HP Station: 201+99.71
HP Elevation: 2026.75
Station: 203+50.00
Elevation: 2023.59

1 5

Step 10. Using the table below, enter the following vertical curve lengths.

VPI	Length
3	400
4	550

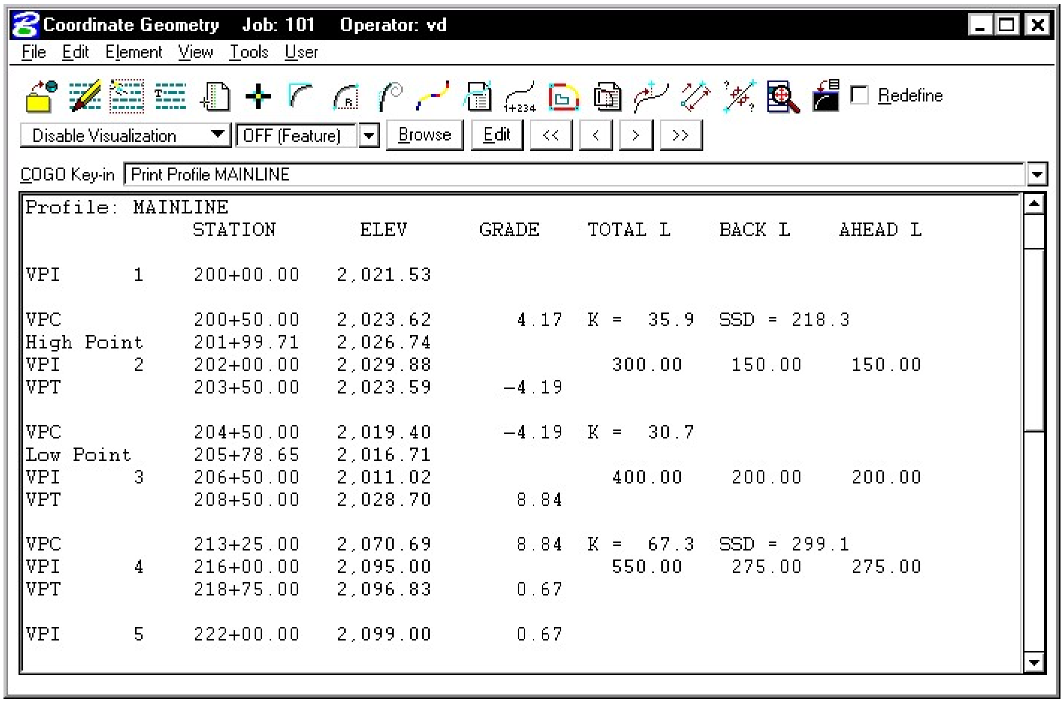
Step 11. When completed, select **File > Save As** from the Profile Generator to save the profile. Populate the dialog box as below then click **OK**. ‘**PROP101.ivd**’ will be created in the working directory. This file will contain the COGO commands used to create the proposed profile.


Save Profile As
Select
OK
Cancel

Profile: MAINLINE
File: prop101.ivd

Step 12. Exit the profile generator. When prompted to save your profile, answer **No** since we did that in Step 10. When prompted to save your Vertical Alignment settings, press **Yes**.

Step 13. Open Cogo and use the **Element > Profile > Utility** tool to see a listing of information about the profile. The **Print** option will provide elevations at any station or increment of stations desired.


Coordinate Geometry Job: 101 Operator: vd
File Edit Element View Tools User
☐ Redefine
Disable Visualization
OFF (Feature)
Browse
Edit
<<
<
>
>>

COGO Key-in: Print Profile MAINLINE

```
Profile: MAINLINE
                STATION        ELEV       GRADE     TOTAL L     BACK L     AHEAD L

VPI      1     200+00.00    2,021.53

VPC            200+50.00    2,023.62       4.17   K =  35.9   SSD = 218.3
High Point     201+99.71    2,026.74
VPI      2     202+00.00    2,029.88                 300.00      150.00      150.00
VPT            203+50.00    2,023.59      -4.19

VPC            204+50.00    2,019.40      -4.19   K =  30.7
Low Point      205+78.65    2,016.71
VPI      3     206+50.00    2,011.02                 400.00      200.00      200.00
VPT            208+50.00    2,028.70       8.84

VPC            213+25.00    2,070.69       8.84   K =  67.3   SSD = 299.1
VPI      4     216+00.00    2,095.00                 550.00      275.00      275.00
VPT            218+75.00    2,096.83       0.67

VPI      5     222+00.00    2,099.00       0.67
```

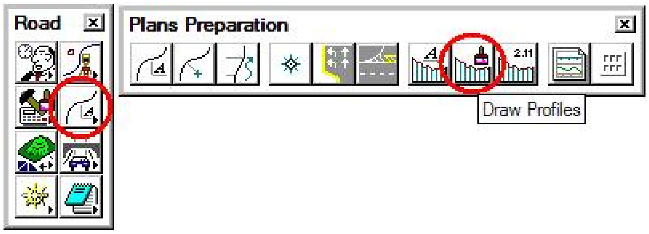
Step 14. Dismiss the **File Utility** dialog by clicking the **X** in the upper right hand corner.

Step 15. Dismiss the **COGO** dialog by clicking the **X** in the upper right hand corner. When prompted to “**Save Session Before Exiting?**” click **No**.

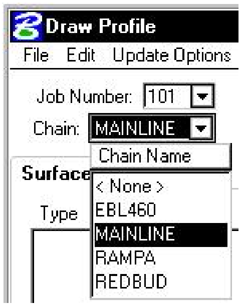
11.2 Drawing the Proposed Centerline Profile

Next, we are drawing the proposed profile utilizing the Draw Profile tool's **COGO** tab.

Step 1. Open the **Draw Profile** tool.


Road
Plans Preparation
Draw Profiles

Step 2. Set Chain to **MAINLINE** by selecting it from the dropdown list.

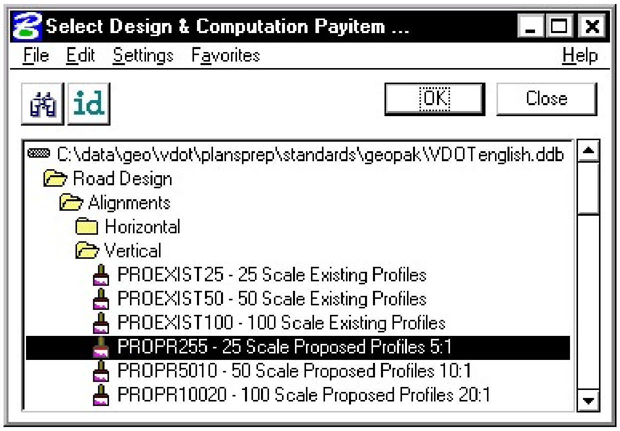

Draw Profile
File Edit Update Options
Surface
Type
Chain Name
< None >
EBL460
MAINLINE
RAMPA
REDBUD

Job Number: 101

Chain: MAINLINE

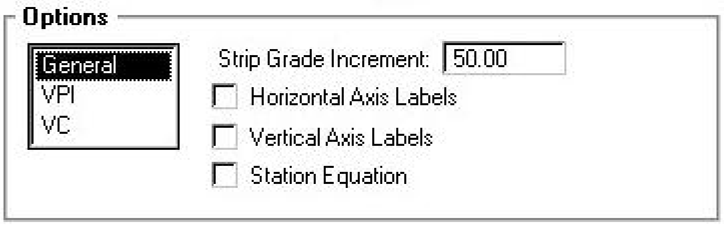
Step 3. Click the **COGO** tab and set the **Label Scale** to **25** in the upper right hand corner.

Step 4. Change the Profile Name to **MAINLINE**. Set the feature as shown below and click OK.


Select Design & Computation Payitem ...
File Edit Settings Favorites Help
OK
Close

C:\data\geo\vdot\plansprep\standards\geopak\VDOTenglish.ddb
- Road Design
  - Alignments
    - Horizontal
    - Vertical
      - PROEXIST25 - 25 Scale Existing Profiles
      - PROEXIST50 - 50 Scale Existing Profiles
      - PROEXIST100 - 100 Scale Existing Profiles
      - PROPR255 - 25 Scale Proposed Profiles 5:1
      - PROPR5010 - 50 Scale Proposed Profiles 10:1
      - PROPR10020 - 100 Scale Proposed Profiles 20:1

Step 5. Under the **Options** section of the dialog, select **General.** Populate the dialog box as below.



Options

- General
- VPI
- VC

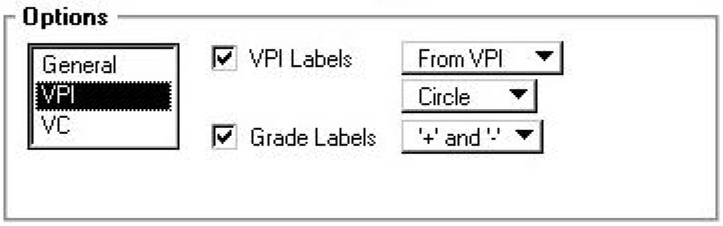
Strip Grade Increment: 50.00

☐ Horizontal Axis Labels

☐ Vertical Axis Labels

☐ Station Equation

Step 6. Under the **Options** section of the dialog, select **VPI.** Populate the dialog box as below.



Options

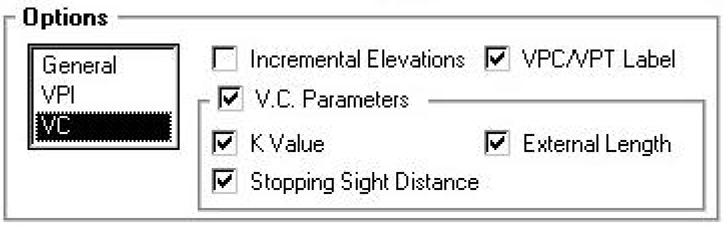
- General
- VPI
- VC

☑ VPI Labels — From VPI

Circle

☑ Grade Labels — '+' and '-'

Step 7. Under the **Options** section of the dialog, select **VC.** Populate the dialog box as below.



Options

- General
- VPI
- VC

☐ Incremental Elevations

☑ VPC/VPT Label

☑ V.C. Parameters

☑ K Value

☑ External Length

☑ Stopping Sight Distance

Step 8. Click the **Add Cogo Profile Settings** icon to draw the proposed profile for the project.

Step 9. Dismiss the **Draw Profile** dialog box by clicking the **X** in the upper right hand corner.

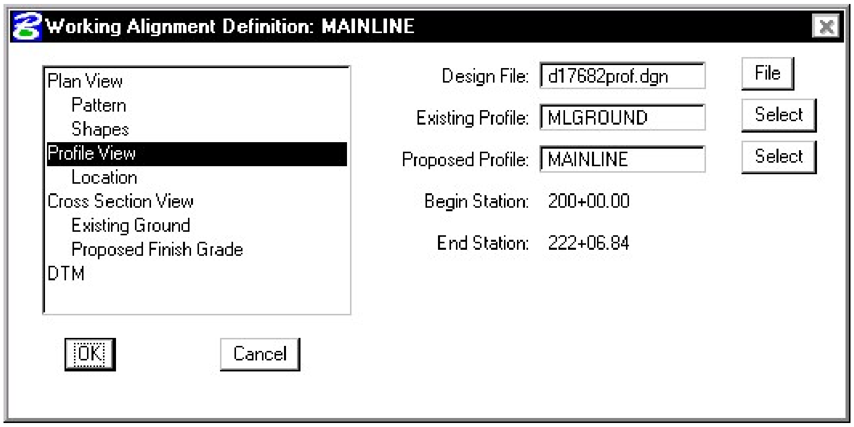
Step 10. Review the proposed vertical alignment.

11.3 Update the Project Manager

We are completing the Profile View of the Working Alignment Definition in Project Manager.

Step 1. Press the **Define** button from the Workflow dialog box of Project Manager,

Step 2. Highlight the **Profile View** option and populate the **Proposed Profile** field as depicted below.


Working Alignment Definition: MAINLINE
Plan View
Pattern
Shapes
Profile View
Location
Cross Section View
Existing Ground
Proposed Finish Grade
DTM
File
Select
Select
OK
Cancel

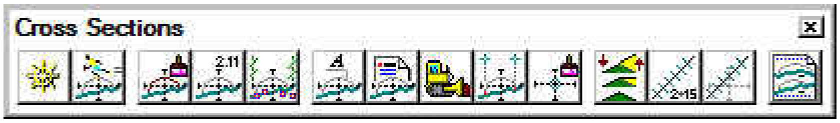
Design File: d17682prof.dgn
Existing Profile: MLGROUND
Proposed Profile: MAINLINE
Begin Station: 200+00.00
End Station: 222+06.84

Step 3. Press the **OK** button to save the updates and close the dialog box.

Step 4. **Exit** MicroStation.

Existing Ground Cross Sections (Optional)

12.1 Introduction

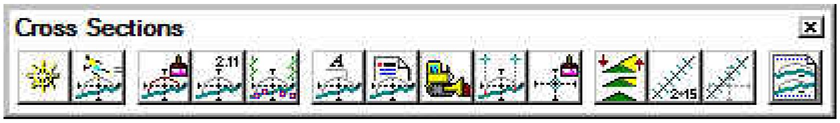
Objectives	To generate existing ground cross sections based on a horizontal alignment and the surface model beneath the alignment, and to review the sections utilizing the Cross Section Navigator tool.
Project Manager	Draw Pattern and Existing Ground Cross Section
Tools	 Cross Sections
Menu Bar Application	GEOPAK Road > Cross Sections > Draw Pattern by Station Range GEOPAK Road > Cross Sections > Ground Cross Sections from DTM GEOPAK Road > Cross Sections > Navigator

The prerequisites to generate existing cross-sections utilizing digital terrain modeling are:

- GEOPAK coordinate geometry database wherein the horizontal alignment is stored.
- GEOPAK binary TIN file, Site Model or Site Object. The Site Model or Object are created utilizing GEOPAK Site Modeler software and are stored within the GEOPAK Site project (gsf) file.
- Pattern lines if pattern by design is to be utilized.

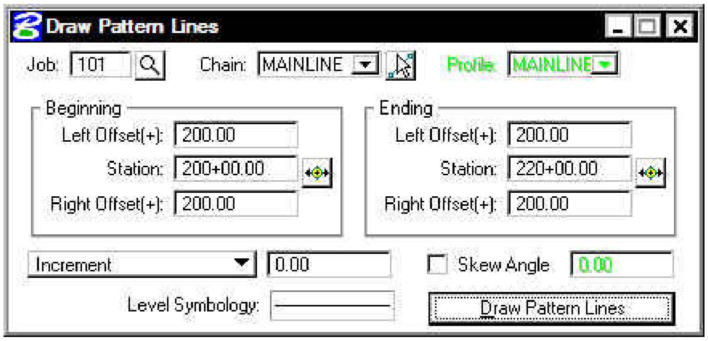
The generation of existing ground cross sections must be invoked from within the 2D MicroStation design file wherein the sections are to be drawn. GEOPAK does not create this MicroStation design file. The user creates the blank design file utilizing the desired seed file, and then GEOPAK draws into it.

12.2 Pattern Lines

Project Manager	Draw Pattern
Tools	
Menu Bar Application	GEOPAK Road > Cross Sections > Draw Patterns By Station Range

Pattern lines are graphical lines and/or line strings in a MicroStation design file that define locations at which the cross sections will be cut.

From the **Project Manager** you will select **Draw Pattern**, and create or select an existing run. When completed, the following Draw Pattern Lines dialog box appears.



Job: 101
Chain: MAINLINE
Profile: MAINLINE

Beginning
Left Offset(+): 200.00
Station: 200+00.00
Right Offset(+): 200.00

Ending
Left Offset(+): 200.00
Station: 220+00.00
Right Offset(+): 200.00

Increment: 0.00
☐ Skew Angle: 0.00
Level Symbology:

Once all of the fields have been completed, and the application is initiated, graphic lines (on the specified level, color and style) are drawn along the chain. This is a visual representation of the location of the cross sections to be generated.

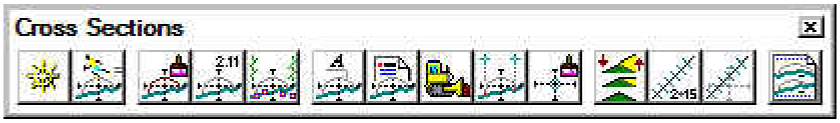
Six methods are supported for drawing the pattern lines:

- Increment – starts at the beginning station, and draws a pattern line at the given increment.
- Even – draws pattern lines at stations divisible by the given value.
- Once – draws a pattern line at a given station.
- Critical Points Horizontal – draws a pattern line at each of the critical point (i.e. POT, PC, PT, etc.) within a chain.
- Critical Points Vertical – Draws a pattern line at each VPC and VPT in addition to the sag and crest station of vertical curves based on the profile defined in the dialog box.
- Superelevation Transitions - The current design file is scanned for Superelevation shapes created with the specified chain. A pattern line is drawn at the beginning and end of each Superelevation shape, ignoring the beginning and ending station fields in the dialog box. Note the Superelevation shapes cannot be in a reference file.

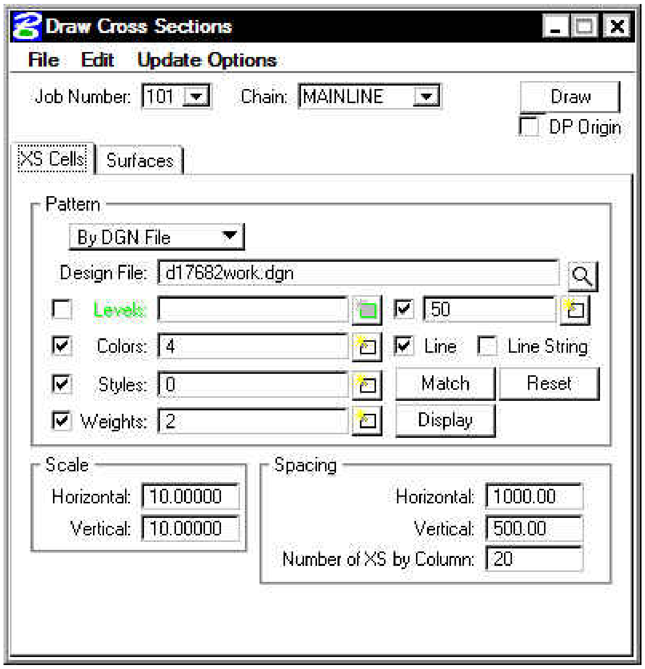
The pattern lines are drawn into the current MicroStation design file. The user can use the MicroStation **Place Smartline** or **Place Line** command to draw additional pattern lines at any user defined location. In addition, MicroStation commands can be utilized to modify pattern lines drawn via the dialog box to lengthen, shorten, delete, copy, move, etc.

NOTE: This should be completed before the existing ground cross sections are generated.

12.3 Generating Cross Sections

Project Manager	Existing Ground Cross Section - Note a run must be created.
Tools	
Menu Bar Application	GEOPAK Road > Cross Sections > Draw Cross Sections from Surfaces

Once the pattern lines have been drawn, the cross sections can be generated. Note the Job Number must be defined in order to populate the Chain list. Once the Chain is defined, the dialog box unghosts as depicted below.



Job Number: 101

Chain: MAINLINE

☐ DP Origin

Pattern

By DGN File

Design File: d17682work.dgn

☐ Levels:

☑ 50

☑ Colors: 4

☑ Line ☐ Line String

☑ Styles: 0

☑ Weights: 2

Scale

Horizontal: 10.00000

Vertical: 10.00000

Spacing

Horizontal: 1000.00

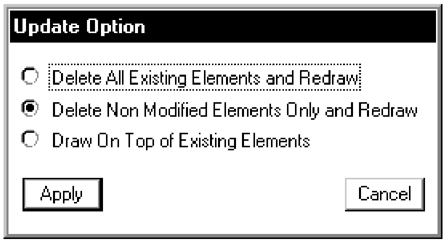
Vertical: 500.00

Number of XS by Column: 20

The rest of the dialog box consists of a menu bar with three listings:

File	Standard file utilities to load, or save settings, plus a dialog box exit option.
Edit	Options to Cut, Copy and Paste rows in the surfaces list box. Also, save and restore settings in the RSC file or clear list of all surfaces.
Update Options:	User-defined options on how the software handles the redrawing of cross sections.
Delete Existing Elements and Redraw	When this option is activated, any existing ground lines previously drawn with this tool are deleted and new ground lines are drawn.
Delete Non-modified Elements and Redraw	When this option is activated, any existing ground lines previously drawn with this tool are deleted and new ground lines are drawn.
Draw on Top of Existing	When this option is activated, any previously drawn ground lines are ignored and a new set is drawn, resulting in two sets of ground lines.

Query	When activated, the user is prompted each time the Draw button is clicked.



Update Option

○ Delete All Existing Elements and Redraw
● Delete Non Modified Elements Only and Redraw
○ Draw On Top of Existing Elements

Two tabs on the dialog box support the input data required to draw cross sections:

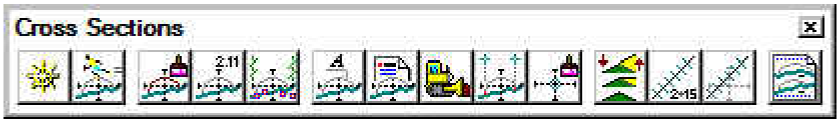
XS Cells	Defines the location of cross sections utilizing either pattern by station or pattern by design. In addition, the scale and spacing are defined within this tab.
Surfaces	Define the surfaces utilized for drawing cross sections. Note multiple surfaces may be drawn in a single processing. Source data includes GEOPAK TIN files, Site Models, or Site Objects.

On the **XS Cells tab**, the **Pattern** group box has three choices:

Pattern by Station	Utilizes Begin and End Station values in addition to an Increment/Even option and Left and Right Offset fields to determine cross section location. This works well when no sections are needed that are at odd stations, skewed or kinked relative to the Chain.
Pattern by DGN	This method utilizes graphical representation and draws one cross section for each line or line string of the specified parameters. Those parameters include Design File which is the name of the file that contains the lines and line strings in addition to their associated symbology.
In Existing Only	No user input is required, as this option draws ground lines only for cross section cells which were previously drawn. Therefore, no other pattern requirements are needed.

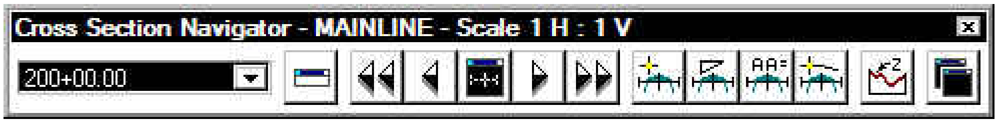
On the **Surfaces** tab, the (Filter Tolerances group box has two fields: **Horizontal** and **Variance**. Both Horizontal and Variance filter tolerances are considered together for each pair of cross section segments. The middle point is deleted if both segment lengths are less than the Horizontal filter tolerance while the projected distance between the mid-point and the chord between the two end points is less than the Variance tolerance.

12.4 Cross Section Navigator

Project Manager	Not accessible from within Project Manager
Tools	
Menu Bar Application	GEOPAK Road > Cross Sections > Navigator

The Cross Section Navigator tool is used to view and traverse between cross sections. It can also be used to draw cross section information.

When the Navigator is invoked, the following dialog box appears.



Cross Section Navigator - MAINLINE - Scale 1 H : 1 V

200+00.00

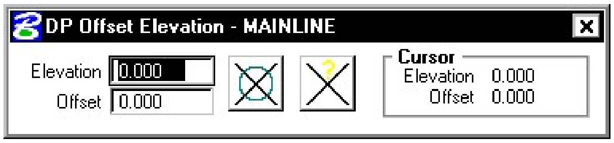
The user can scan through the cross sections by either choosing the station from the drop down list, or by using the First Section, Previous Section, Next Section, or Last Section icons (arrowheads). The Reset Navigator icon window centers the current station to the view.

The **Open View Control Dialog Box** enables the user to open several windows to view different portions of the cross section at the same time. The user can view the whole cross section in view 1, the left side in view 2, and the right side in view 3, etc.

Cross section elements can be added or modified using MicroStation tools or GEOPAK cross section drawing tools, as detailed in the table below.

DP Offset Elevation

Data points at a given offset/elevation, or find the offset/elevation of the cursor location.



DP Offset Elevation - MAINLINE

Elevation 0.000

Offset 0.000

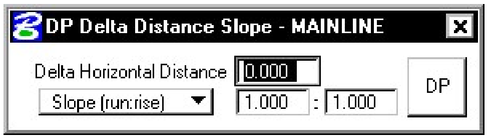
Cursor

Elevation 0.000

Offset 0.000

DP Delta Distance Slope

Draws a line at a given horizontal distance and slope.



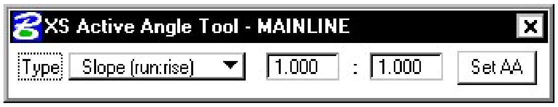
DP Delta Distance Slope - MAINLINE

Delta Horizontal Distance 0.000

Slope (run:rise) 1.000 : 1.000

XS Active Angle Tool

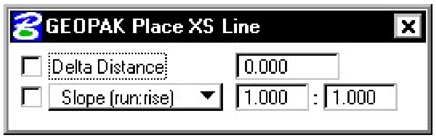
Sets the active angle to the given value. If a MicroStation tool is used with the active angle option, this value is used.



XS Active Angle Tool - MAINLINE

Type Slope (run:rise) 1.000 : 1.000

Draw XS Line Draws a cross section line. The length and/or slope can be specified.



GEOPAK Place XS Line

☐ Delta Distance 0.000

☐ Slope (run:rise) 1.000 : 1.000

12.5 Summary - Basic Steps to Creating Existing Ground Cross Sections from a DTM

Step 1. Requires a horizontal alignment stored in *.GPK file.

Step 2. Requires an existing triangle file (TIN) from a DTM.

Step 3. Draw pattern lines.

Step 4. Process cross sections using Draw Cross Sections tool.

Step 5. Review and modify (if necessary).

LAB 12: Existing Ground Cross Sections

12.1 Draw Patterns

The first step is drawing MicroStation lines or line strings to define the location of the existing ground cross sections.

Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB12.EXE**.

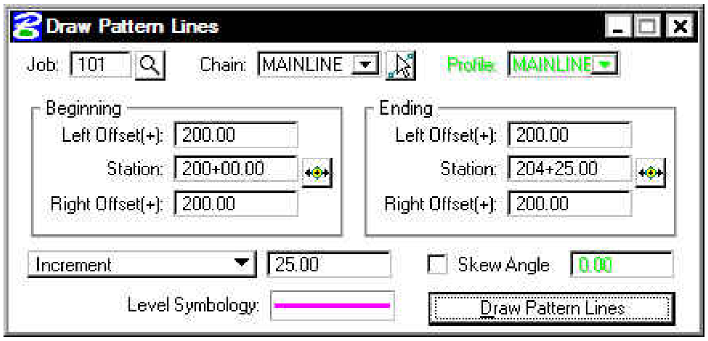
Step 2. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682work.dgn**

Access **Project Manager**. It should automatically access the Road workflow dialog box since we "remembered" the options in Exercise 2.

Step 3. Select the **Draw Pattern** button from the **Road Project: 17682.prj** workflow dialog box.

Step 4. Create a new run called **MAINLINE**. Select the newly created run then click **OK**.

Step 5. Populate the dialog box as depicted below.


Draw Pattern Lines

Job: 101

Chain: MAINLINE

Profile: MAINLINE

Beginning
Left Offset(+): 200.00
Station: 200+00.00
Right Offset(+): 200.00

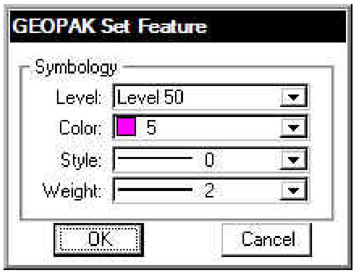
Ending
Left Offset(+): 200.00
Station: 204+25.00
Right Offset(+): 200.00

Increment: 25.00

☐ Skew Angle: 0.00

Level Symbology:

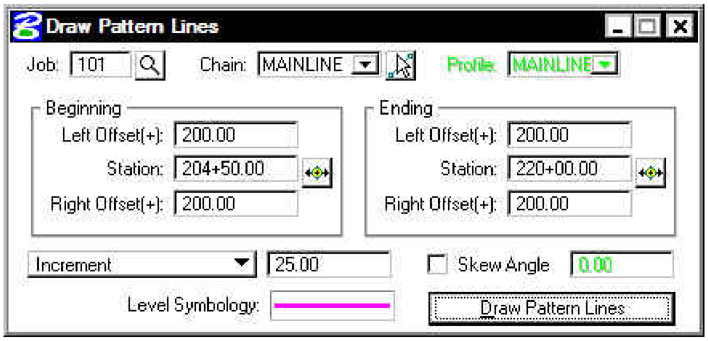
Step 6. Double click the Level Symbology graphic. Populate the **Set Feature** dialog box as below then click OK.


GEOPAK Set Feature

Symbology
Level: Level 50
Color: 5
Style: 0
Weight: 2

Step 7. Click **Draw Pattern Lines** to initiate the plotting of the patterns into the design file for the station range supplied.

Step 8. Populate the dialog box as depicted below.



Draw Pattern Lines

Job: 101

Chain: MAINLINE

Profile: MAINLINE

Beginning

Left Offset(+): 200.00

Station: 204+50.00

Right Offset(+): 200.00

Ending

Left Offset(+): 200.00

Station: 220+00.00

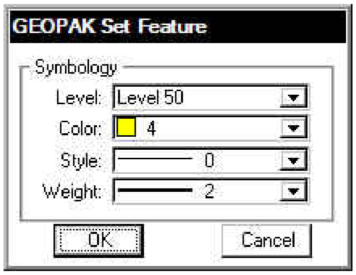
Right Offset(+): 200.00

Increment 25.00

☐ Skew Angle 0.00

Level Symbology:

Step 9. Double click the Level Symbology graphic. Populate the **Set Feature** dialog box as below then click OK.



GEOPAK Set Feature

Symbology

Level: Level 50

Color: 4

Style: 0

Weight: 2

Step 10. Click **Draw Pattern Lines** to initiate the plotting of the patterns into the design file for the station range supplied.

Step 11. Review the pattern lines.

Step 12. Dismiss the **Draw Pattern Lines** dialog box by clicking the **X** in the upper right hand corner. When prompted to “**Save Settings**” click “**Yes**”.

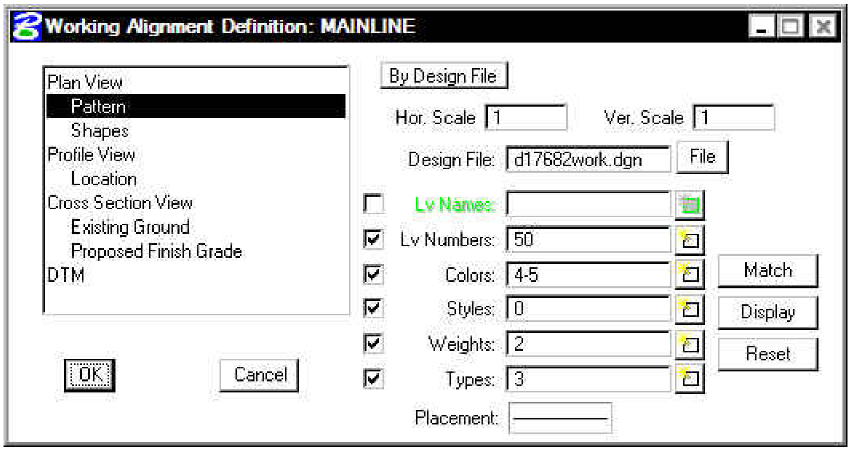
12.2 Update Project Manager

We are completing the Pattern section of the Working Alignment Definition in Project Manager.

Step 1. From the Workflow dialog box of Project Manager, click the **Define** button.

Step 2. Highlight the **Pattern** option and populate the dialog box as depicted below. Since we are in the pattern file, you can use the Select button to accomplish this task rather than manually typing in the information.

NOTE**:** Be sure to use colors 4 and 5.



Working Alignment Definition: MAINLINE

- Plan View
  - Pattern
  - Shapes
- Profile View
  - Location
- Cross Section View
  - Existing Ground
  - Proposed Finish Grade
- DTM

Hor. Scale: 1
Ver. Scale: 1
Design File: d17682work.dgn
☐ Lv Names:
☑ Lv Numbers: 50
☑ Colors: 4-5
☑ Styles: 0
☑ Weights: 2
☑ Types: 3
Placement:

Step 3. Click **OK** to close the **Working Alignment** dialog box.

12.3 Generate Existing Ground Cross Sections

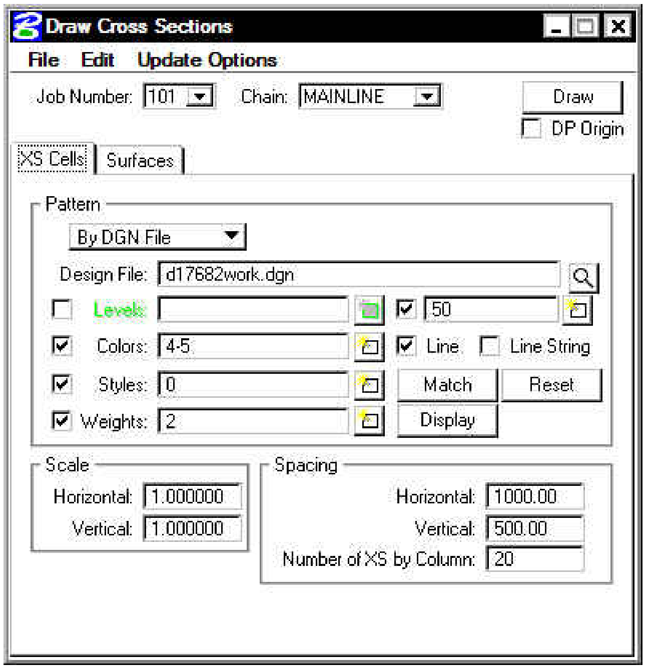
Step 1. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682xsmainline.dgn**

Step 2. Click the **Existing Ground Cross Sections** button on the Project Manager dialog box.

Step 3. Create a run called **MAINLINE**. Select the newly created run then click **OK**.

Step 4. Generate the existing ground cross-sections by populating the dialog box as shown on the following dialog boxes and clicking the **Draw** button to initiate the routine.

Note: The **Display Settings** for the existing ground line are set to level 1, color 1, weight 5, style 2.

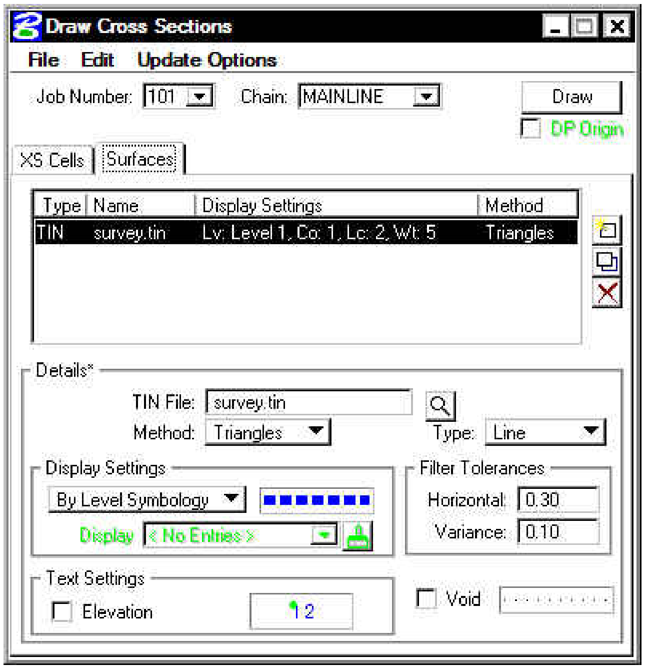

Draw Cross Sections
File
Edit
Update Options
Draw
XS Cells
Surfaces
Match
Reset
Display

Job Number: 101
Chain: MAINLINE
☐ DP Origin

Pattern
By DGN File
Design File: d17682work.dgn
☐ Levels:
☑ 50
☑ Colors: 4-5
☑ Line ☐ Line String
☑ Styles: 0
☑ Weights: 2

Scale
Horizontal: 1.000000
Vertical: 1.000000

Spacing
Horizontal: 1000.00
Vertical: 500.00
Number of XS by Column: 20


Draw Cross Sections
File
Edit
Update Options
Draw
XS Cells
Surfaces

Job Number: 101
Chain: MAINLINE
☐ DP Origin

Type	Name	Display Settings	Method
TIN	survey.tin	Lv: Level 1, Co: 1, Lc: 2, Wt: 5	Triangles

Details*
TIN File: survey.tin
Method: Triangles
Type: Line

Display Settings
By Level Symbology
Display: < No Entries >

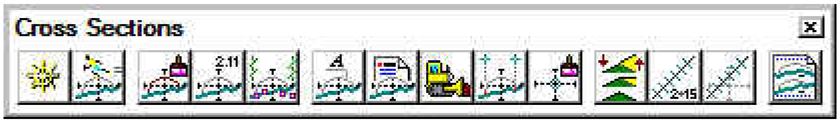
Filter Tolerances
Horizontal: 0.30
Variance: 0.10

Text Settings
☐ Elevation
☐ Void

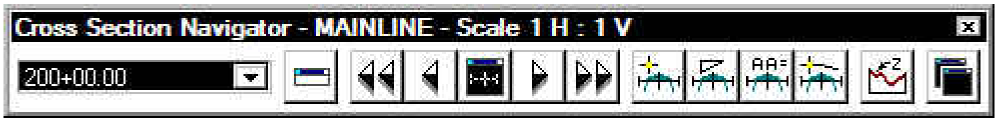
NOTE: Do not forget to click the **Modify** icon to update the symbology settings.

Step 5. Dismiss the **Draw Cross Sections** dialog box by clicking the **X** in the upper right hand corner. When prompted to "**Save Settings**" click "**Yes**".

12.4 Review Cross Sections


Cross Sections

Step 1. Select the **Cross Section Navigator** tool from the **Road Tools** tool frame.


Cross Section Navigator - MAINLINE - Scale 1 H : 1 V
200+00.00

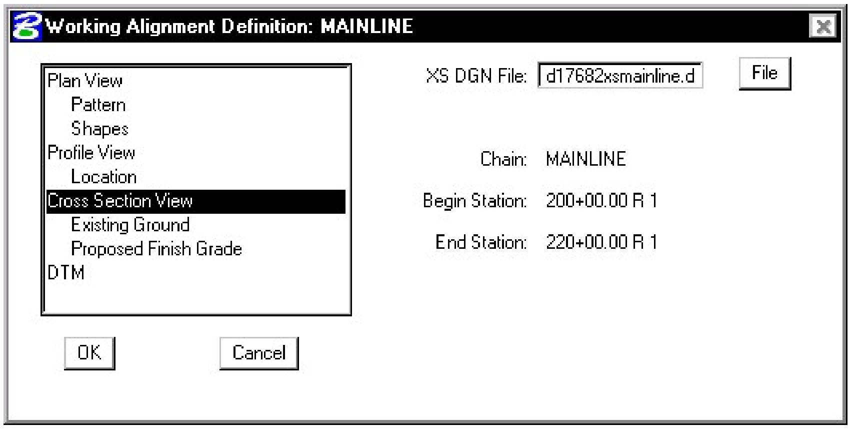
Step 2. Use the **Cross Section Navigator** to browse and check your existing cross sections.

Step 3. Dismiss the **Cross Section Navigator** dialog box by clicking the **X** in the upper right hand corner when done.

12.5 Update Project Manager

We are completing the Cross Section and Existing Ground sections of the Working Alignment Definition in Project Manager.

Step 1. Highlight the **Cross Section View** option and populate the dialog box as depicted below:


Working Alignment Definition: MAINLINE
Plan View
Pattern
Shapes
Profile View
Location
Cross Section View
Existing Ground
Proposed Finish Grade
DTM
File
OK
Cancel

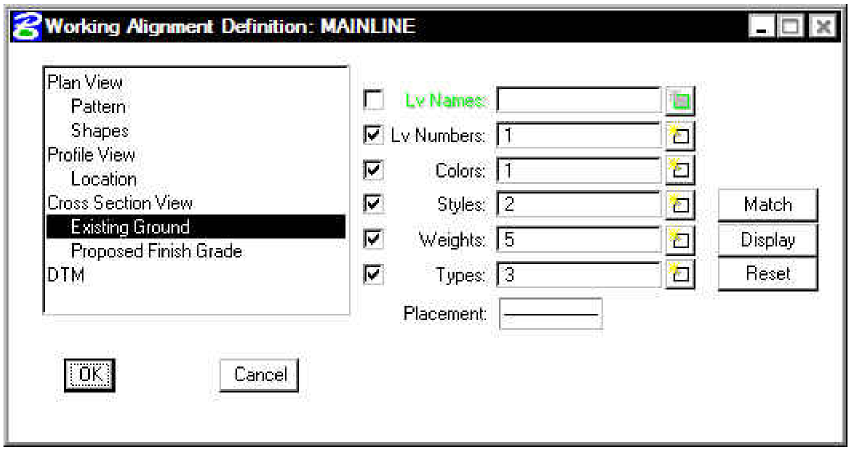
XS DGN File: d17682xsmainline.d

Chain: MAINLINE

Begin Station: 200+00.00 R 1

End Station: 220+00.00 R 1

Step 2. Highlight the **Existing Ground** option and populate the dialog box as depicted below


Working Alignment Definition: MAINLINE
Plan View
Pattern
Shapes
Profile View
Location
Cross Section View
Existing Ground
Proposed Finish Grade
DTM
Match
Display
Reset
OK
Cancel

☐ Lv Names:

☑ Lv Numbers: 1

☑ Colors: 1

☑ Styles: 2

☑ Weights: 5

☑ Types: 3

Placement:

Step 4. Click the **OK** button to close the dialog box.

Step 5. Upon reviewing the sections, it is desirable to “lock” the elements to prevent accidental deletion or modification in later steps.

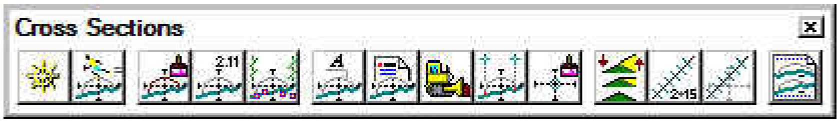
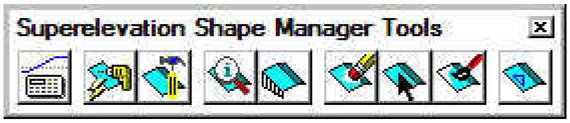
Select **Edit > Select All** from the MicroStation menu bar. Then select **Edit > Lock** to lock the elements.

Step 6. **Exit** MicroStation.

CHAPTER 13

Superelevation (Optional)

13.1 Introduction

Objectives	Learn to use GEOPAK **Automated Superelevation** dialog box and **Autoshape Builder** to apply superelevation to a roadway.
Project Manager	Calculate Superelevation
Tools	 
Menu Bar Application	GEOPAK Road > Cross Sections >Superelevation Shape Manager Tools

GEOPAK supports a myriad of options for the definition of pavement on proposed cross sections. They range from a single slope specification emanating from a baseline / profile on each section, to a complicated multiple roadway, each with its own superelevation transitions.

The most basic is the project where no superelevation transitions are required, i.e., the roadway slope for all pavement (if any) can be specified as a single value. In this case, the slope can be defined with the proposed cross section processing and any additional superelevation work is not required.

Another option is the definition of superelevation when roadways are constant widths without tapers, i.e., turn lanes, acceleration and deceleration lanes, etc. In these areas, the automated superelevation can be utilized, based on a user-defined design speed and considering the geometry of the specified roadway. After careful review of the data (in ASCII format) and overriding the computed values, GEOPAK draws pavement representations as complex shapes into a MicroStation 2D design file.

A third option is the definition of superelevation when roadways are not constant widths, i.e., gore areas, turn lanes, acceleration and deceleration lanes, etc. In these areas, graphic elements within a MicroStation 2D design file are utilized to create complex shapes which define the superelevation transitions.

A combination of these tools can be combined with a project, or even within a single roadway. The shapeless mode is excellent for rural applications, low volume city streets, frontage roads, etc., while the automated method quickly generates automated shapes for more complex roadways. Any area, which cannot be defined via the automated method, can be augmented by the graphical method.

For some users, only simple narrow shapes will be required when designing new roadways or performing slope correction for reconstruction projects. The proposed cross section criteria will stretch the pavement out to the true proposed edge of pavement based on finding plan view elements that represent the EOP.

13.2 Automated Superelevation (AutoShape Input File Maker)

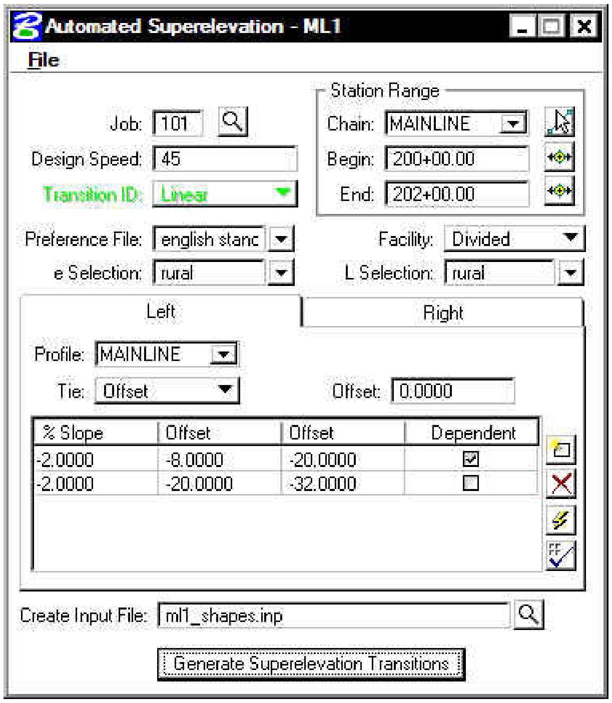
Project Manager	Calculate superelevation
Tools	Superelevation Shape Manager Tools

The GEOPAK Superelevation package enables the user to create, edit, and run an autoshape input file quickly, basing it on an existing COGO alignment.

A rich set of preferences is available which gives the user complete control over every aspect of the standardization of the superelevation design process. AASHTO Method V is available as a default, along with the ability to employ user-defined lookup tables both for e (superelevation rate) and for runoff length. User-defined equations may also be entered to compute these values. A thorough set of options is available for resolving the superelevation conflicts of Reverse Curves, Compound Curves, Broken Back Curves, and Short Curves.

GEOPAK calculates superelevation transition locations for any alignment stored into the coordinate geometry database. The main superelevation dialog box is simple and straightforward, allowing the user to select which preference file is to be used for the current session, as well as enabling the entry of the typical section lane configuration in the simple engineering terms of Number of Lanes, Lane Widths, Median Width (if any), and Cross Slope. More complex lane configurations may be represented as needed.

Upon computation of the superelevation parameters (cross slopes and stationing), the information is stored in an ASCII file, where the user may review and modify the transitions, if desired. After reviewing the information, the ASCII file is executed from the Autoshape Builder to generate superelevation shapes.



Automated Superelevation - ML1

Job: 101

Design Speed: 45

Transition ID: Linear

Station Range

Chain: MAINLINE

Begin: 200+00.00

End: 202+00.00

Preference File: english stanc

Facility: Divided

e Selection: rural

L Selection: rural

Profile: MAINLINE

Tie: Offset

Offset: 0.0000

% Slope	Offset	Offset	Dependent
-2.0000	-8.0000	-20.0000	☑
-2.0000	-20.0000	-32.0000	☐

Create Input File: ml1_shapes.inp

Job	Coordinate geometry database wherein the desired chains and profiles are stored.
Chain	GEOPAK baseline chain dictating the horizontal geometry for which superelevation transitions are calculated. This chain is also called the Shape Cluster Baseline in the Auto Shape input file.
Begin Station	When the chain is defined, GEOPAK populates the Begin Station with the default beginning of the chain. To compute superelevation for part of a chain, adjust the station.

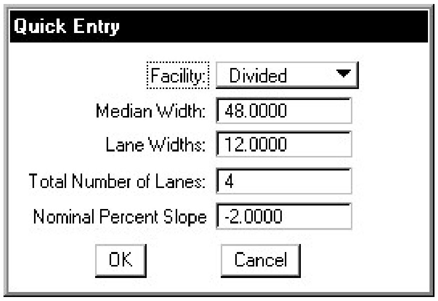
End Station	When the chain is defined, GEOPAK populates the End Station with the default beginning of the chain. To compute superelevation for part of a chain, adjust the station.
Design Speed	Design speed that determines what Design Speed is to be used either in the tables or equations for e and length computations.
Preference File **e selection** **L selection**	The Preferences File combo box selects which Preference File is to be used for this computation. The various Preferences Files which are available in the combo box are determined by what files have the .sep file extension in the Preference Files Path on the User Directories dialog box. When it is set, the available e and length Selection combo boxes are filled in according to the csv file names as specified in the Preferences File. Those combo boxes determine which table within the .csv file will be used for computation.
Facility	Facility determines whether the roadway cross section is to be divided or undivided. This option determines two things. For the dialog box box, it determines whether or not the values Profile, Tie (Offset or PGL), and or the Tie or PGL values may be different. If they are different then two shape clusters are to be generated, which usually is required for a median. The state of the Facility option button also determines which Preference is used as found on the Distribution tab of the Preferences dialog box.
Left / Right tabs	The area enclosed in the Left / Right tabs are for the determination of values specific to shape clusters.

NOTE: The right and left tabs contain data pertaining to each lane within each roadway. If the Facility is undivided, then the left tab is for the left lane(s) while the right tab is for the right lane(s). If the Facility is divided, then the right tab is for the entire right roadway, while the left tab is for the left roadway.

Create Input File	ASCII file wherein GEOPAK creates the autoshape input file. DO NOT include the extension, as GEOPAK adds .inp to the field.
Generate Superelevation Transitions	Commence automatic superelevation calculations
Profile	GEOPAK profile defined as the Shape Cluster Profile in the Auto Shape input file.
Tie	Offset - Horizontal distance from the Profile (PGL) to the Chain. PGL Chain - Chain stored in the gpk file that the shapes will be computed from. This chain does not require a profile be stored with it as the defined profile will be applied to this chain.
Offsets	Offsets define the dimension of the shape (usually a lane) by two offset distances from the baseline. Note that tapers are not supported. Offset distances are negative if measured to the left. . Each lane must have the same offset on the left as the left adjacent lane and must have the same offset on the right as the right adjacent lane (no gaps in offsets). Computation may not proceed if this condition is not met.
% Slope	Cross slope of each shape in normal crown in percent format. A negative sign denotes the roadway going downward, while emanating away from the PGL. A Normal Crown section of 2.0% would, therefore, be entered as –2.0. Lane

offset values are entered in terms of master units, i.e., feet or meters.

Dependent / Independent	One dependent shape, which is based on the profile, is required for each cluster. Other shapes, drawn not based on the profile, but on adjoining lanes, are independent. For example, turn lanes are drawn abutting next to the mainline roadway, so they are independent. However, a lane based on the profile for its initial elevation, such as one of the through lanes, is profile dependent.
Edit buttons: **Add** **Delete** **Edit**	To add a line to the list box, type in the values in the edit fields, then click the Add icon. To delete a line, highlight the desired line, then click the Delete icon. To modify a line, highlight the desired line, (which is then displayed in the edit fields), change the desired values, then click the Edit icon, which updates the list box.
Quick Entry	Enables the user to populate the shape cluster list boxes quickly while entering the data using engineering terminology. When clicked, the dialog box depicted below opens.



Quick Entry

Facility: Divided

Median Width: 48.0000

Lane Widths: 12.0000

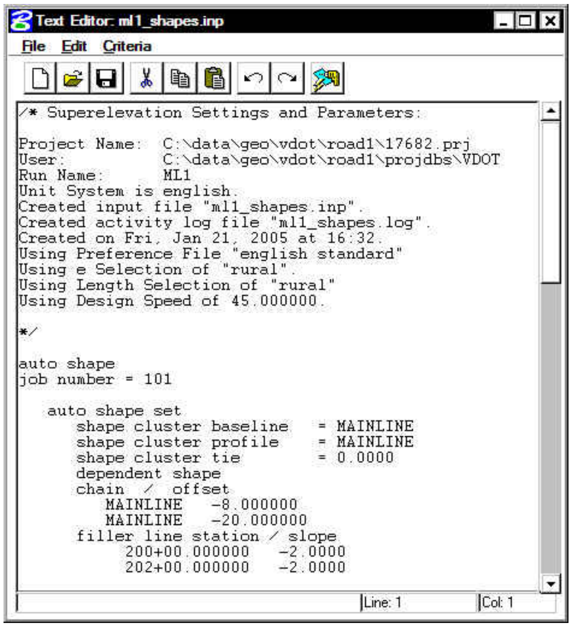
Total Number of Lanes: 4

Nominal Percent Slope -2.0000

Rectify Lanes (Bottom tool to the right of the list box)	If **Offset** values have been entered that create a gap between lanes, the **Rectify Lanes** option will remove this gap. Click the **Rectify Lanes** button and the values will be modified so that any gaps will be removed.

Selection of the **Generate Superelevation Transitions** button performs the actual superelevation computations. Three things happen at this point.

- First, the superelevation transitions as computed by GEOPAK are written to the Autoshape Input File specified by the user (in the Create Input File field).
- Second, the log file is written.
- Finally, the Autoshape Input File is loaded into the text editor running within MicroStation. This Autoshape Input File Editor has an icon at the top that allows the Autoshape Input File to be run. Autoshape Input files can also be run from the Autoshape Builder.



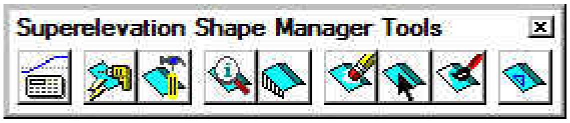
```
/* Superelevation Settings and Parameters:

Project Name:  C:\data\geo\vdot\road1\17682.prj
User:          C:\data\geo\vdot\road1\projdbs\VDOT
Run Name:      ML1
Unit System is english.
Created input file "ml1_shapes.inp".
Created activity log file "ml1_shapes.log".
Created on Fri, Jan 21, 2005 at 16:32.
Using Preference File "english standard"
Using e Selection of "rural".
Using Length Selection of "rural"
Using Design Speed of 45.000000.

*/

auto shape
job number = 101

   auto shape set
      shape cluster baseline   = MAINLINE
      shape cluster profile    = MAINLINE
      shape cluster tie        = 0.0000
      dependent shape
      chain  /  offset
         MAINLINE   -8.000000
         MAINLINE   -20.000000
      filler line station / slope
           200+00.000000   -2.0000
           202+00.000000   -2.0000
```

13.2.1 Example - Auto Shape ASCII Input File

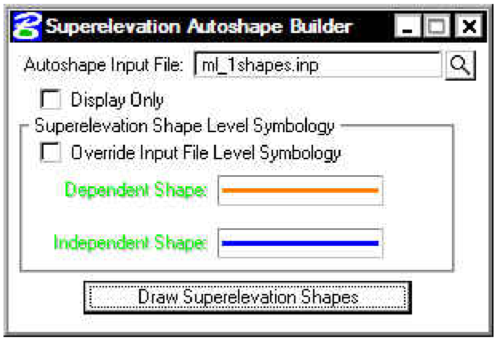
```
/* Superelevation Settings and Parameters:
Project Name:  C:\data\geo\vdot\PlansPrep\17682.prj
User:          C:\data\geo\vdot\PlansPrep\projdbs\VDOT
Run Name:      MAINLINE
Unit System is english.
Created input file "mainline_shapes.inp".
Created activity log file "mainline_shapes.log".
Created on Wed, Nov 06, 2002 at 13:11.
Using Preference File "english standard"
Using e Selection of "rural".
Using Length Selection of "rural"
Using Design Speed of 35.000000.

*/

auto shape
job number = 101

   auto shape set
      shape cluster baseline   = MAINLINE
      shape cluster profile    = MAINLINE
      shape cluster tie        = 0.0000
      dependent shape
      chain  /  offset
         MAINLINE   -8.0000
         MAINLINE   -20.0000
      filler line station / slope
           200+00.000000   -2.0000
           206+46.876488   -2.0000
           208+45.876488    4.8000  /* Curve ML-1 */
           209+80.032227    4.8000  /* Curve ML-1 */
           211+79.032227   -2.0000
           213+13.162662   -2.0000
           213+31.032227   -2.6000  /* Curve ML-2 */
         219+02.785686   -2.6000  /* Curve ML-2 */
         219+20.655251   -2.0000
         222+06.840000   -2.0000

auto shape set
   shape cluster baseline   = MAINLINE
   shape cluster profile    = MAINLINE
   shape cluster tie        = 0.0000
   independent shape
   chain  /  offset
      MAINLINE   -20.0000
      MAINLINE   -32.0000
   filler line station / slope
         200+00.000000   -2.0000
         206+46.876488   -2.0000
         208+45.876488    4.8000  /* Curve ML-1 */
         209+80.032227    4.8000  /* Curve ML-1 */
         211+79.032227   -2.0000
         213+13.162662   -2.0000
         213+31.032227   -2.6000  /* Curve ML-2 */
         219+02.785686   -2.6000  /* Curve ML-2 */
         219+20.655251   -2.0000
         222+06.840000   -2.0000

auto shape set
   shape cluster baseline   = MAINLINE
   shape cluster profile    = MAINLINE
   shape cluster tie        = 0.0000
   dependent shape
   chain  /  offset
      MAINLINE   8.0000
      MAINLINE   20.0000
   filler line station / slope
         200+00.000000   -2.0000
         207+63.935312   -2.0000
         208+45.876488   -4.8000  /* Curve ML-1 */
         209+80.032227   -4.8000  /* Curve ML-1 */
         210+61.973403   -2.0000
         211+94.032227   -2.0000
         213+31.032227    2.6000  /* Curve ML-2 */
         219+02.785686    2.6000  /* Curve ML-2 */
         220+39.785686   -2.0000
         222+06.840000   -2.0000

auto shape set
   shape cluster baseline   = MAINLINE
   shape cluster profile    = MAINLINE
   shape cluster tie        = 0.0000
   independent shape
   chain  /  offset
      MAINLINE   20.0000
      MAINLINE   32.0000
   filler line station / slope
         200+00.000000   -2.0000
         207+63.935312   -2.0000
         208+45.876488   -4.8000  /* Curve ML-1 */
         209+80.032227   -4.8000  /* Curve ML-1 */
         210+61.973403   -2.0000
         211+94.032227   -2.0000
         213+31.032227    2.6000  /* Curve ML-2 */
```

```
           219+02.785686    2.6000  /* Curve ML-2 */
           220+39.785686   -2.0000
           222+06.840000   -2.0000

   Plot Parameters
      Dependent Shape
         lv = 63
         co = 6
         lc = 0
         wt = 2
      Dependent Text
         lv = 63
         co = 6
      Independent Shape
         lv = 63
         co = 1
         lc = 0
         wt = 2
      Independent Text
         lv = 63
         co = 1

Write shapes into dgn = C:\data\geo\vdot\PlansPrep\d17682work.dgn
```

13.3 Draw Shapes into Plan View File

Project Manager	None
Tools	
Menu Bar Application	GEOPAK Road > Cross Sections >Superelevation Shape Manager Tools

Once the shape input file (fname.inp) has been created and reviewed, the designer can run the input file to place the superelevation shapes into the specified graphics file. To use the interactive method to define roadway superelevation (in a .dgn file) the designer pushes the **Autoshape Builder** icon from the Superelevation Shape Manager Tools tool bar (or alternately from this same icon within the Text Editor as described above).



Autoshape Input File: ml_1shapes.inp

☐ Display Only

Superelevation Shape Level Symbology

☐ Override Input File Level Symbology

Dependant Shape:

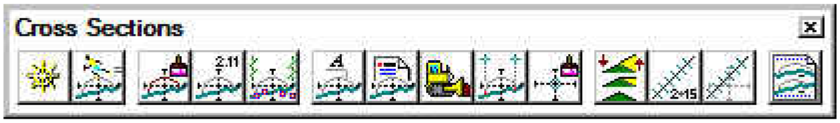
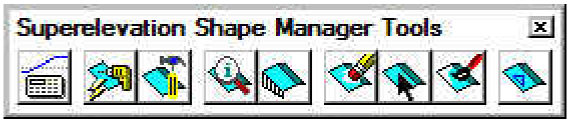
Independent Shape:

Input File	Name of .inp file (fname.inp) created by the Automated superelevation generation containing the transitions.
Display Only	Create the shapes in “Display Only” mode. That is, they are not written to the

	design file and a view Update operation eliminates them, as does zoom in, etc.
Override Input File Level Symbology	This option is used to override the Plot Parameters settings in the Superelevation Shapes input file.

The shapes are placed in a 2D graphics file on level 63 by default. The plot parameters can be modified in the input file with a text editor prior to building the shapes into the graphics file or with the **User > Symbologies** pull down on the Automated Superelevation dialog box.

13.4 Shape Analysis Tools

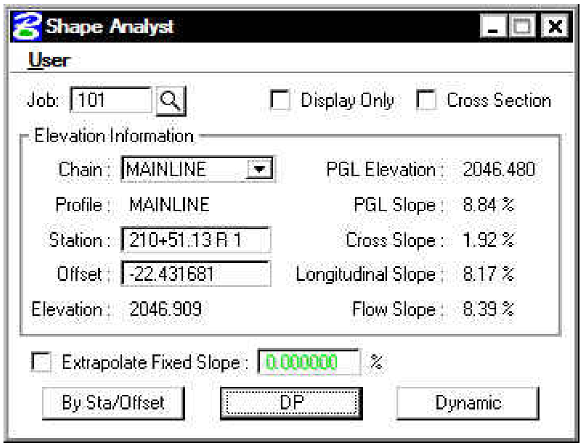
Tools	 
Menu Bar Application	GEOPAK Road > Cross Sections >Superelevation Shape Manager Tools

The tools in the Superelevation Shape Manager Tools toolbox are detailed below.

Auto. Superelevation	Performs the actual calculations and stores the results in an ASCII file, known as the autoshape input file.
Autoshape Builder	Processes the autoshape input file and draws corresponding complex shapes in the specified 2D design file.
Shape Maker	Graphical method of drawing irregular superelevation shapes. This method is utilized for gore areas, turn lanes, etc.
Shape Analyst	The Shape Analyst tool provides information on any point within a GEOPAK superelevation shape.
Shape Profiler	The Shape Profiler tool provides profile information based on user-define increments intersecting a GEOPAK superelevation shape.
Shape Editor	The Shape Editor tool enables the user to dynamically change parameters on a previously created shape. This includes filler line stationing, dynamic moving of shapes, etc.
Shape Selector	The Shape Selector tool highlights or selects shapes based on a wide range of user queries or filters.
Shape Properties	The Shape Properties tool provides information on any GEOPAK superelevation shape. In addition, this shape information can be modified on individual shapes of selections of shapes.
Shape To DTM	Provides the option to store a DTM Dat file from the superelevation shapes. In addition, it can plot the calculated elevations into the design file at a user specified interval.

13.4.1 Shape Analyst

The Shape Analyst tool is extremely useful, as it provides information on any point within a GEOPAK superelevation shape.



Job: 101

☐ Display Only

☐ Cross Section

Chain: MAINLINE

Profile: MAINLINE

Station: 210+51.13 R 1

Offset: -22.431681

Elevation: 2046.909

PGL Elevation: 2046.480

PGL Slope: 8.84 %

Cross Slope: 1.92 %

Longitudinal Slope: 8.17 %

Flow Slope: 8.39 %

☐ Extrapolate Fixed Slope: 0.000000 %

Before using this tool, the **Job Number** must be selected. Upon selecting a Job Number, a **Chain** must be selected that the shapes are defined relative to. If **Display Only** is enabled, information like elevation and a flow arrow are drawn to the view, but they are not written as elements to the active MicroStation file.

When the **Cross Section** toggle is not activated and a data point is issued within a shape, the elevation of the data point and a flow arrow are displayed. When the toggle is activated, a dashed line is placed through the data point, radial to the shaped cluster baseline. In addition to the elevation and flow arrow placed at the data point, elevations are displayed where the cross section line intersects any superelevation shape and cross slopes are labeled for each shape.

The **By Sta/Offset** button causes the current Station / Offset value to be projected back onto the shape cluster baseline and the elevation of the projected point is displayed. This option can be manual entry only and requires no data point on the screen.

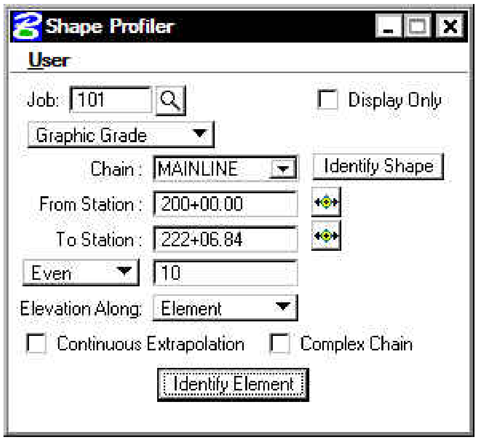
The **DP** button works within a superelevation shape whose X, Y coordinates are utilized to compute station / offset from the specified shape cluster baseline, which is subsequently utilized in conjunction with the shape to compute the various slopes and elevations. After the DP button is clicked, numerous data points can be placed. It is not necessary to click the DP button again. Each corresponding station / offset is displayed along with the associated output information.

The **Dynamic** button activates the dynamic mode. As the cursor moves across the screen, any momentary pause places the elevation and flow arrow in the MicroStation file and computes and displays the analysis information.

The **Extrapolate Fixed Slope** toggle is another option supported in the Shape Analyst tool. The option is utilized when the data point, dynamic point or station / offset is outside of the shape. When the option is not activated, the data point is projected back to the shape's chain. The elevations at the edges of the shape are displayed and the slope of the outside shape is projected to the data point. When the toggle is enabled, the user defined slope is projected from the outer most shape to the data point to determine an elevation.

13.4.2 Shape Profiler

The Shape Profiler tool computes elevations along any GEOPAK Shape or MicroStation element at a user specified interval. The element can be inside or outside of the shapes.



Job: 101
☐ Display Only
Graphic Grade
Chain : MAINLINE
From Station : 200+00.00
To Station : 222+06.84
Even 10
Elevation Along: Element
☐ Continuous Extrapolation ☐ Complex Chain

The **Job** field can be populated by key in or using the **Select…** button. After selecting a GPK file, click **Identify Shape** and data point on any shape along the desired **Chain**. Set the **From Station** and **To Station** fields by keying in values or using the **DP** buttons.

Even
Increment
Intersect

Even should be selected when it is desired to have the elevations compute at the even station values. **Increment** will allow the elevations to be computed starting at the **From Station**, then adding the increment value to that station. Intersect is used with an element to compute elevations at all locations that the element intersects the shape(s).

The **Elevation Along** toggle can be set to **Shape** or **Element**. When set to **Shape**, elevations will be computed based on the Even/Increment value along both longitudinal edges of the shape. When set to **Element** the elevations are computed along the element based on the Even/Increment/Intersect toggle.

Continuous Extrapolation allows the user to identify multiple longitudinal elements outside of the shape area and compute elevations by a user defined **Slope** and one of three methods: **Radial to Baseline, Radial From Element, or Radial to Element**.

LAB 13: Superelevation

As a reminder, our project contains distinct sections:

Section 1	4 lane divided highway with depressed median from Sta. 200+00 to Sta. 202+00. Left side of the roadway will be resurfacing while the right side is new construction.
Section 2	4 lane divided highway with raised median from Sta. 202+00 to Sta. 204+25. Left side of the roadway will be resurfacing while the right side is new construction.
Section 3	4 lane undivided highway from Sta. 205+00 to Sta. 211+00.
Section 4	2 Lane highway with Entrances and Exit Ramps from Sta. 211+00 to Sta. 220+00.
Section 5	Exit Ramp (RampA)

Based on this information, normally we would need to process the Superelevation separately for each of the above sections. **Due to time constraints, we will only calculate superelevation for the section from Sta. 205+00 to Sta. 211+00.**

13.1 Automated Superelevation

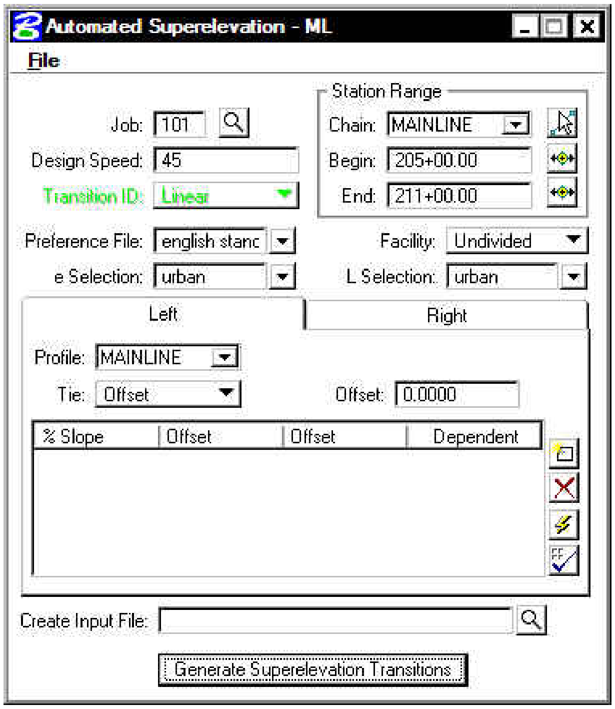
Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB13.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682work.dgn**

Step 3. Click the **Calculate Superelevation** button from the **Road Project: 17682.prj** workflow dialog box.

Step 4. Create a new run called '**ML'** and click **OK**. Once the Automated Superelevation dialog box has been invoked, the dialog box on the right will be displayed.

Fill out the upper portion of the dialog box as shown.


Automated Superelevation - ML
File
Station Range
Generate Superelevation Transitions

Job: 101
Design Speed: 45
Transition ID: Linear
Chain: MAINLINE
Begin: 205+00.00
End: 211+00.00
Preference File: english stanc
Facility: Undivided
e Selection: urban
L Selection: urban
Left / Right
Profile: MAINLINE
Tie: Offset
Offset: 0.0000

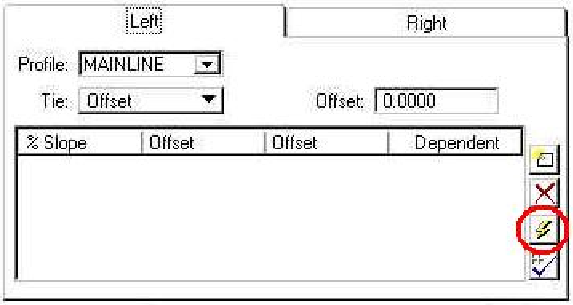
% Slope	Offset	Offset	Dependent

Create Input File:

Step 5. The profile from which the shapes should be computed should be set to **MAINLINE** for both the Left and Right roadway tabs.

Step 6. The **Tie** option should be set to **offset** and the offset value should be set to **0.0** to force the PGL (Profile Grade Line) to run along the centerline of construction (MAINLINE).

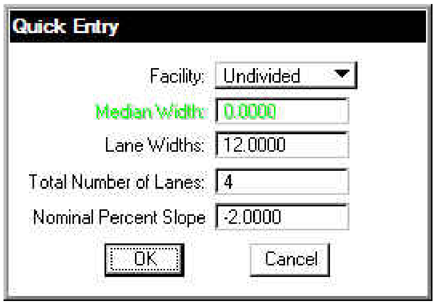
Step 7. Press the **Quick Entry** icon as shown in the image below.



Profile: MAINLINE
Tie: Offset
Offset: 0.0000

% Slope	Offset	Offset	Dependent

Step 8. Fill out the Quick Entry dialog box as shown below and press OK.



Quick Entry

Facility: Undivided

Median Width: 0.0000

Lane Widths: 12.0000

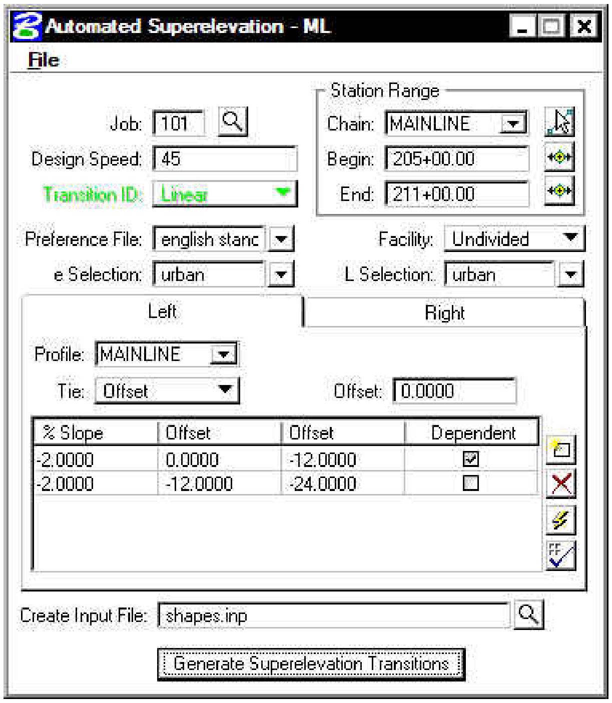
Total Number of Lanes: 4

Nominal Percent Slope -2.0000

NOTE**:** Quick Entry can be used only if the lane configuration to the left and right sides of the baseline are the same.

Step 9. Provide an Input Filename (**shapes.inp**) to store the computed transitions for this station range.

The dialog box should appear as shown:



Automated Superelevation - ML

Job: 101

Design Speed: 45

Transition ID: Linear

Station Range

Chain: MAINLINE

Begin: 205+00.00

End: 211+00.00

Preference File: english stanc

Facility: Undivided

e Selection: urban

L Selection: urban

Profile: MAINLINE

Tie: Offset

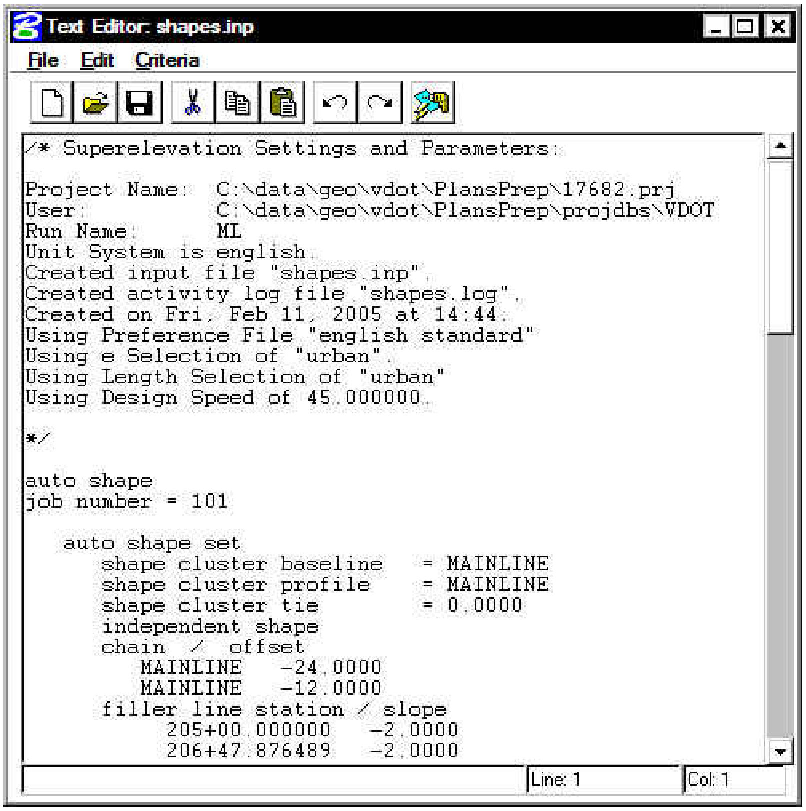
Offset: 0.0000

% Slope	Offset	Offset	Dependent
-2.0000	0.0000	-12.0000	☑
-2.0000	-12.0000	-24.0000	☐

Create Input File: shapes.inp

Step 10. Click the **Generate Superelevation Transitions** button to initiate the calculation of the transitions for the Left and Right roadway.

Step 11. Review the computations within the Text Editor dialog box.



```
/* Superelevation Settings and Parameters:

Project Name:  C:\data\geo\vdot\PlansPrep\17682.prj
User:          C:\data\geo\vdot\PlansPrep\projdbs\VDOT
Run Name:      ML
Unit System is english.
Created input file "shapes.inp".
Created activity log file "shapes.log".
Created on Fri, Feb 11, 2005 at 14:44:
Using Preference File "english standard"
Using e Selection of "urban".
Using Length Selection of "urban"
Using Design Speed of 45.000000.

*/

auto shape
job number = 101

   auto shape set
      shape cluster baseline   = MAINLINE
      shape cluster profile    = MAINLINE
      shape cluster tie        = 0.0000
      independent shape
      chain  /  offset
         MAINLINE   -24.0000
         MAINLINE   -12.0000
      filler line station / slope
           205+00.000000   -2.0000
           206+47.876489   -2.0000
```

Step 12. To build these shapes into the graphics file, click the **Autoshape Builder** icon within the Text Editor dialog box. This will automatically draw the shapes into your design file on level 63.

Step 13. Close the Text Editor dialog box as well as the automated superelevation dialog box. When prompted to Save Superelevation settings, click **Yes**.

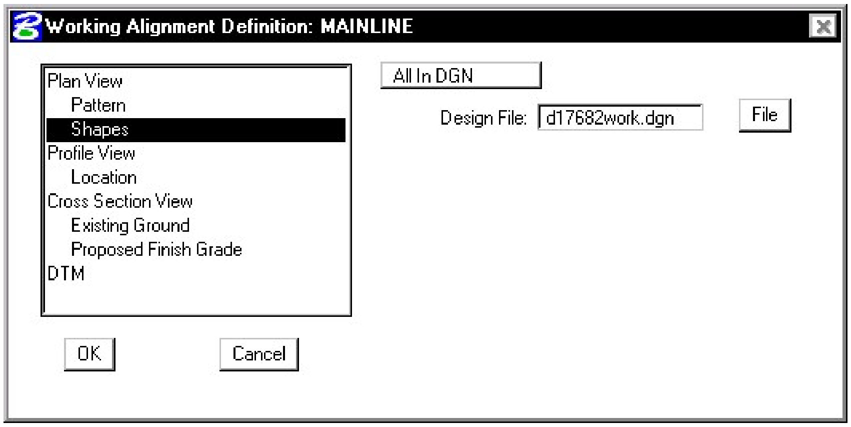
Step 14. Review the Superelevation shapes created in the design file.

13.2 Update the Project Manager

We are completing the Plan View category of the Working Alignment Definition in Project Manager.

Step 1. From the Workflow dialog box of Project Manager, click the **Define** button.

Step 2. Highlight the **Plan View > Shapes** option and populate the Shapes Design file as shown below:


Working Alignment Definition: MAINLINE
Plan View
Pattern
Shapes
Profile View
Location
Cross Section View
Existing Ground
Proposed Finish Grade
DTM
All In DGN
File
OK
Cancel

Design File: d17682work.dgn

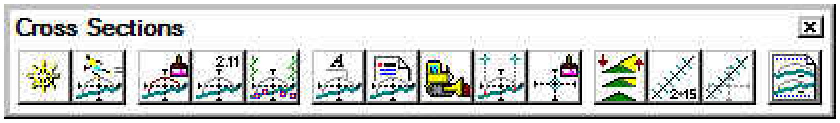
Step 3. Click the **OK** button to save the updates and close the dialog box.

Step 4. **Exit** MicroStation.

CHAPTER 14

Cross Section Sheets (Optional)

14.1 Introduction

Objectives	Learn the procedures for laying out cross section sheets.
Project Manager	Cross Section Sheets
Tools	
Menu Bar Application	None, except batch processing of an input file.

The GEOPAK sheet layout component provides an automated tool to draw cross section data in a format suitable for producing hard-copy cross section construction drawings. The input includes specifying sheet layout parameters as well as the graphic design file where the cross sections were originally created by GEOPAK. The output is a MicroStation design file of the cross sections. Each cross section is displayed as a reference file and labels such as baseline, station, offsets and elevation are added. There are several advantages to using sheet input:

- The cross sections will be sorted in numeric order for the specified baseline.
- The cross sections will be spaced closer together.
- The original cross section file is left intact and any modifications to the cross sections will be automatically displayed in the sheet file due to the use of reference files.
- The cross sections are placed into "sheet format" according to user specified criteria.

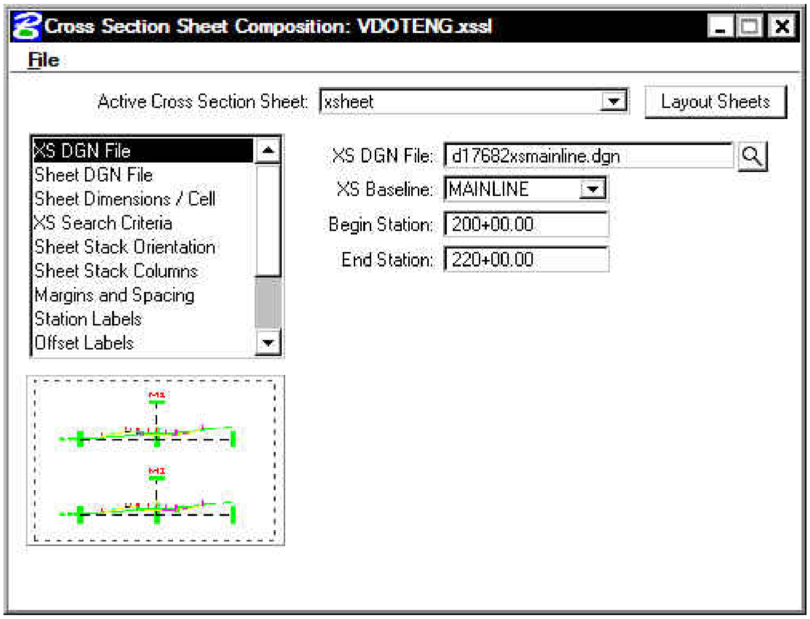
The parameters for each sheet are defined in a **Sheet Library**. In order to lay out sheets, a Sheet Library must be attached to the current session. The name of the currently attached Sheet Library is shown in the title bar. Sheet Libraries have an extension of xssl. An unlimited number of different sheets can be stored within one library. When the user begins the sheet process, he selects the desired sheet layout from the attached library, which loads the associated parameters.

If a different Sheet Library is needed, it can be attached via the menu items **File > Sheet Library > Attach**. Detailed information on the set-up of the Sheet Library can be found in the online help section entitled "Sheet Library Set-up."

14.2 Accessing The Cross Section Sheet Layout Tool

The **Cross Section Sheet** tool can be accessed by selecting **Applications > GEOPAK ROAD > Cross Sections > Cross Section Sheet Composition**. It can also be invoked from **Project Manager** by clicking the **Cross Section Sheets** button or by selecting the **Cross Section Sheet Composition** icon from the **GEOPAK ROAD** tool frame.

Once the **Cross Section Sheet Composition** tool is selected, the dialog below appears.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels

Active Cross Section Sheet: xsheet

XS DGN File: d17682xsmainline.dgn

XS Baseline: MAINLINE

Begin Station: 200+00.00

End Station: 220+00.00

14.2.1File Menu

File > Sheet Library

TOOL	DESCRIPTION
New	Create a new Sheet Library.
Attach	Attach a Sheet Library.
Save	Saves a Sheet Library.
Save As	Save a Sheet Library as a new name.

File > Sheet

TOOL	DESCRIPTION
New	Create a new Sheet in a Sheet Library.
Delete	Delete a Sheet in a Sheet Library.
Copy	Copy a Sheet in a Sheet Library.
Update	Update a Sheet in a Sheet Library.

File > Load V7 Input File

This option gives the user the ability to load an ASCII input file that was created in previous versions of GEOPAK.

File > Save Settings

Saves all dialog settings in Project Manager.

File > Layout Sheets

Layout cross sections into sheet format.

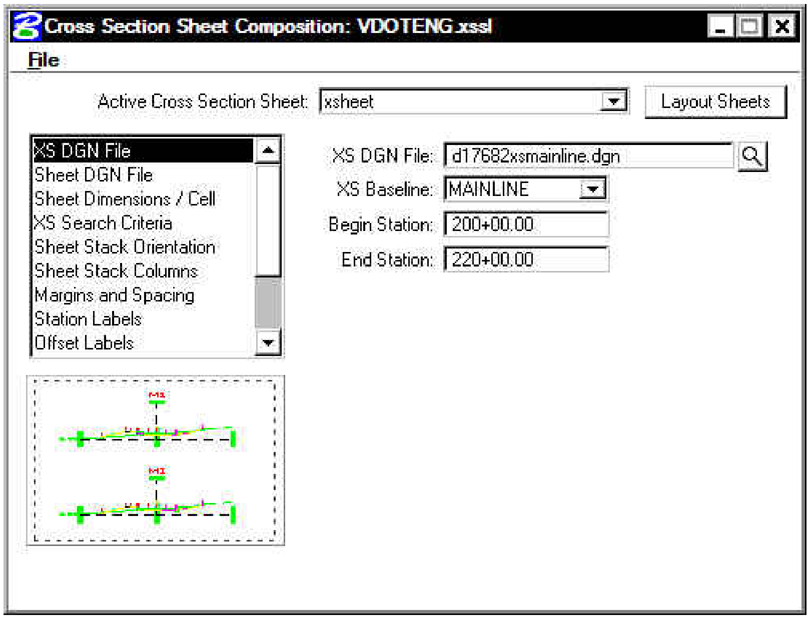
File > Exit

Exit the Cross Section Sheet Composition application.

14.3 Cross Section Sheets Dialog

The left side of the dialog contains the list of parameters required to generate cross section sheets. When each parameter is selected, the dialog changes as do the key-in fields to reflect the selected parameter.

XS DGN File – Tells the software where to locate the cross sections. The Chain and stationing will be filled out automatically if defined via the project manager. By default, the software will find all elements within the confines of the cross section cell.



Cross Section Sheet Composition: VDOTENG.xssl

Active Cross Section Sheet: xsheet

XS DGN File: d17682xsmainline.dgn

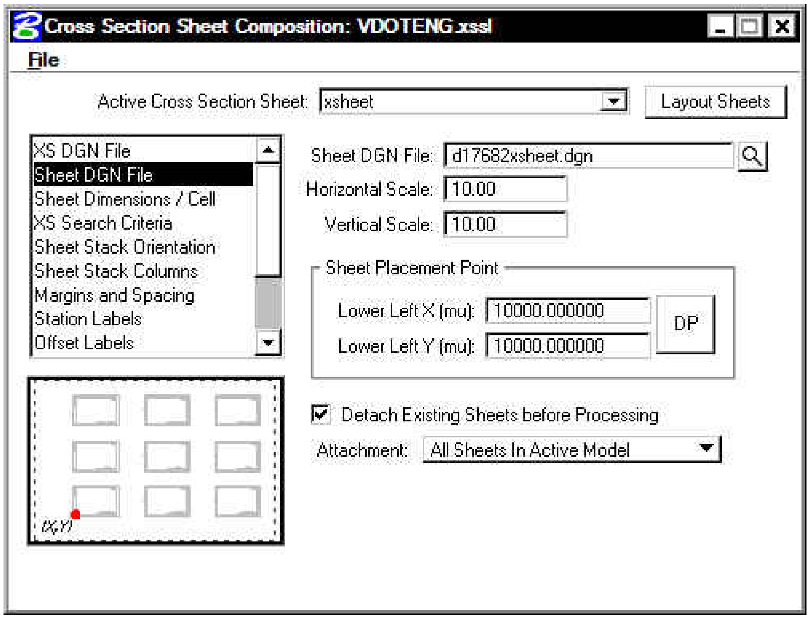
XS Baseline: MAINLINE

Begin Station: 200+00.00

End Station: 220+00.00

File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels

Sheet DGN File - Specifies which file the cross section sheets will be placed in. Also allows you to set the horizontal and vertical scale at which they are to be laid out and the coordinate location in the MicroStation Design file at which the sheets will be placed. If **Detach Existing Sheets before Processing** is toggled on, then all elements in the file are removed and existing reference files are detached before processing.


Cross Section Sheet Composition: VDOTENG.xssl

Active Cross Section Sheet: xsheet

Sheet DGN File: d17682xsheet.dgn

Horizontal Scale: 10.00

Vertical Scale: 10.00

Sheet Placement Point

Lower Left X (mu): 10000.000000

Lower Left Y (mu): 10000.000000

☑ Detach Existing Sheets before Processing

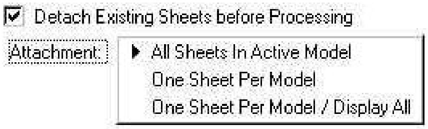
Attachment: All Sheets In Active Model

File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
DP
(X,Y)

Attachemnt: **All Sheets In Active Model** – All sheets are placed in the active model

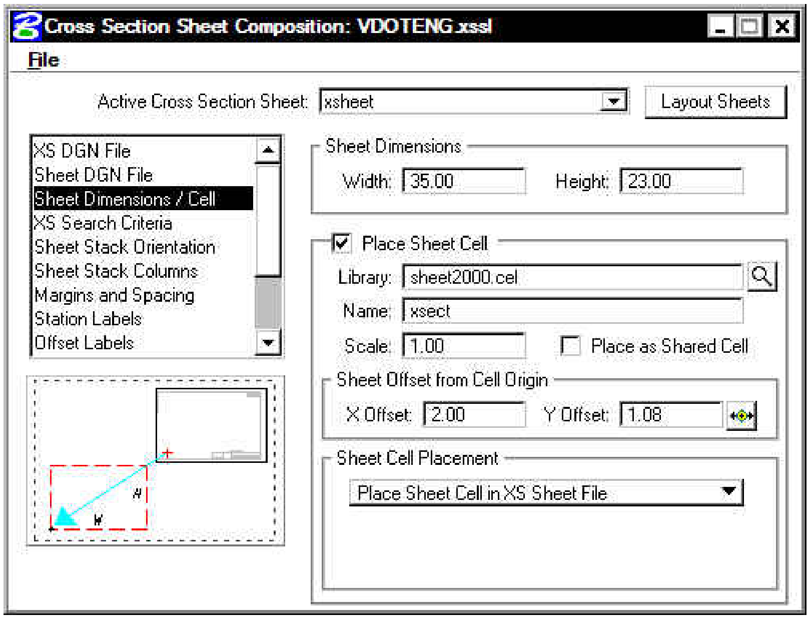
One Sheet Per Model – Each sheet is placed in a separate model

One Sheet Per Model / Display All – Each sheet is placed in a separate model and all sheet are attached to the active model


☑ Detach Existing Sheets before Processing

Attachment:
All Sheets In Active Model
One Sheet Per Model
One Sheet Per Model / Display All

Sheet Dimensions/Cell – Sheet Dimensions defines the Sheet Height and Sheet Width to be used for the cross section sheet. When **Place Sheet Cell** is toggled on, the application will place a sheet border cell from the specified cell library. A scale can be applied and the sheet cells can be placed as Shared Cells. **Sheet Offset from Cell Origin** is the **X** and **Y** offset from the sheet border cell origin.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
H
W

Active Cross Section Sheet: xsheet

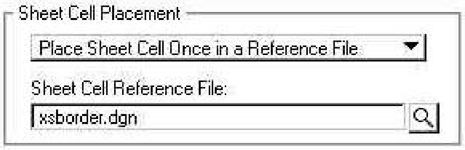
Sheet Dimensions
Width: 35.00
Height: 23.00

☑ Place Sheet Cell
Library: sheet2000.cel
Name: xsect
Scale: 1.00
☐ Place as Shared Cell

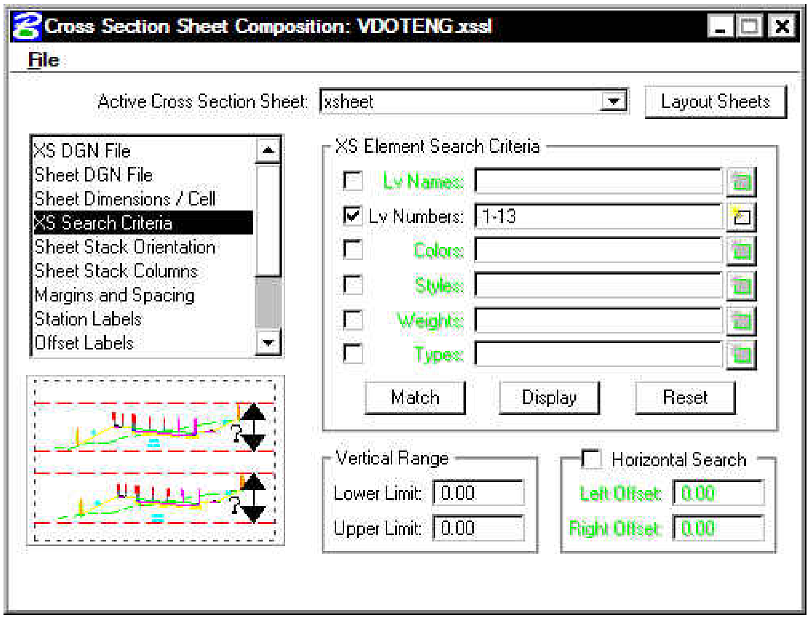
Sheet Offset from Cell Origin
X Offset: 2.00
Y Offset: 1.08

Sheet Cell Placement
Place Sheet Cell in XS Sheet File

There are two options for **Sheet Cell Placement**. The sheet border cell can be placed in the sheet file with the cross section reference files as shown above. It can also be placed once in a reference file then the sheet cell file is attached to the file that contains the cross section reference files as many times as it is needed. This option is shown below.


Sheet Cell Placement
Place Sheet Cell Once in a Reference File
Sheet Cell Reference File:
xsborder.dgn

XS Search Criteria – Indicates the search criteria (symbology) for the data to be used as input to the sheet layout software. If you need to look farther than that (i.e. outside of the cell), you can use the **Lower and Upper Range Limit** values to extend beyond the cell limits. The **Horizontal Search** will look outside the limits of the Sheet Dimensions.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
XS Element Search Criteria
Match
Display
Reset
Vertical Range
Horizontal Search

Active Cross Section Sheet: xsheet

☐ Lv Names:

☑ Lv Numbers: 1-13

☐ Colors:

☐ Styles:

☐ Weights:

☐ Types:

Lower Limit: 0.00

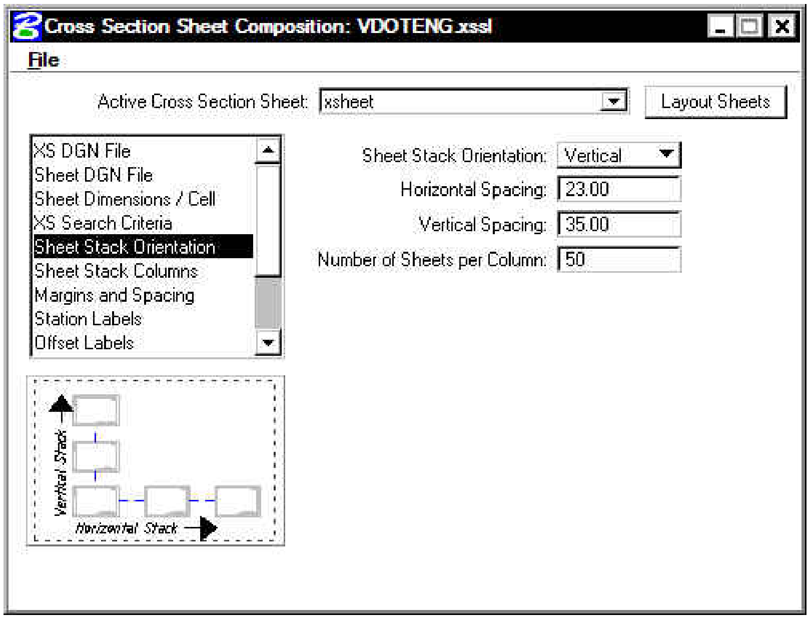
Upper Limit: 0.00

☐ Horizontal Search

Left Offset: 0.00

Right Offset: 0.00

Sheet Stack Orientation – Determines whether you want the sheets to be stacked vertically or horizontally. Also allows you to set the maximum number of sheets you want placed per column in the file as well as the Horizontal and Vertical spacing between sheets.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
Vertical Stack
Horizontal Stack

Active Cross Section Sheet: xsheet

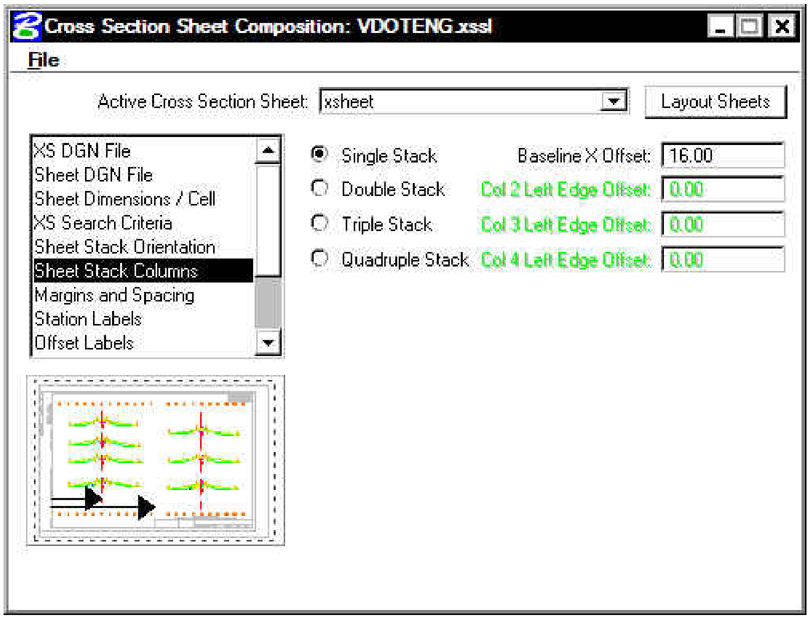
Sheet Stack Orientation: Vertical

Horizontal Spacing: 23.00

Vertical Spacing: 35.00

Number of Sheets per Column: 50

Sheet Stack Columns – Determines whether you want a single stack or a double stack of cross sections per sheet. Baseline X Offset defines the distance from the left-hand edge of the sheet to the zero offset position (i.e. baseline) of the cross sections. If you select Double Stack, you can give an offset value which is the distance of the second stack from the left hand edge of the sheet. There are also options for Triple and Quadruple stacking.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels

Active Cross Section Sheet: xsheet

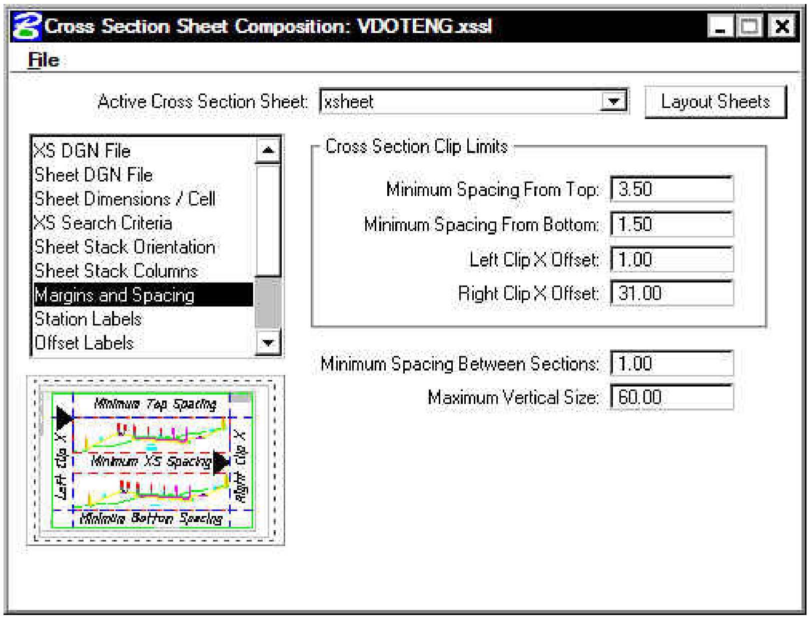
● Single Stack Baseline X Offset: 16.00

○ Double Stack Col 2 Left Edge Offset: 0.00

○ Triple Stack Col 3 Left Edge Offset: 0.00

○ Quadruple Stack Col 4 Left Edge Offset: 0.00

Margins and Spacing – Cross Section Clip Limits defines the clipping limits from the left hand edge of the sheet. To the left of the Left Clip X Offset remains clear space and to the right of the Right Clip X Offset remains clear space. All minimum spacing requirements as well as the maximum allowable vertical size of any cross section is also set here.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
Minimum Top Spacing
Minimum XS Spacing
Minimum Bottom Spacing
Left Clip X
Right Clip X

Active Cross Section Sheet: xsheet

Cross Section Clip Limits

Minimum Spacing From Top: 3.50

Minimum Spacing From Bottom: 1.50

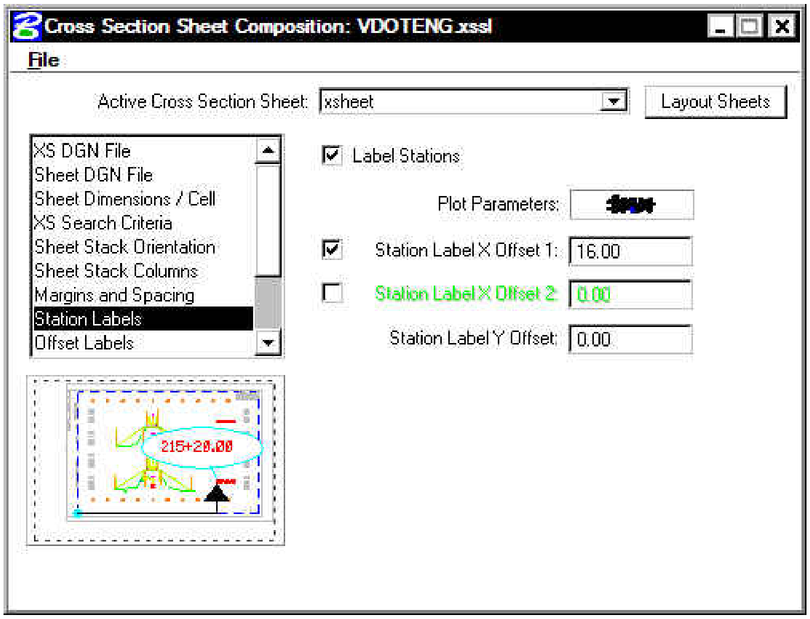
Left Clip X Offset: 1.00

Right Clip X Offset: 31.00

Minimum Spacing Between Sections: 1.00

Maximum Vertical Size: 60.00

Station Labels – Allows you to define the station label locations and plot parameters.



Cross Section Sheet Composition: VDOTENG.xssl

Active Cross Section Sheet: xsheet

☑ Label Stations

Plot Parameters:

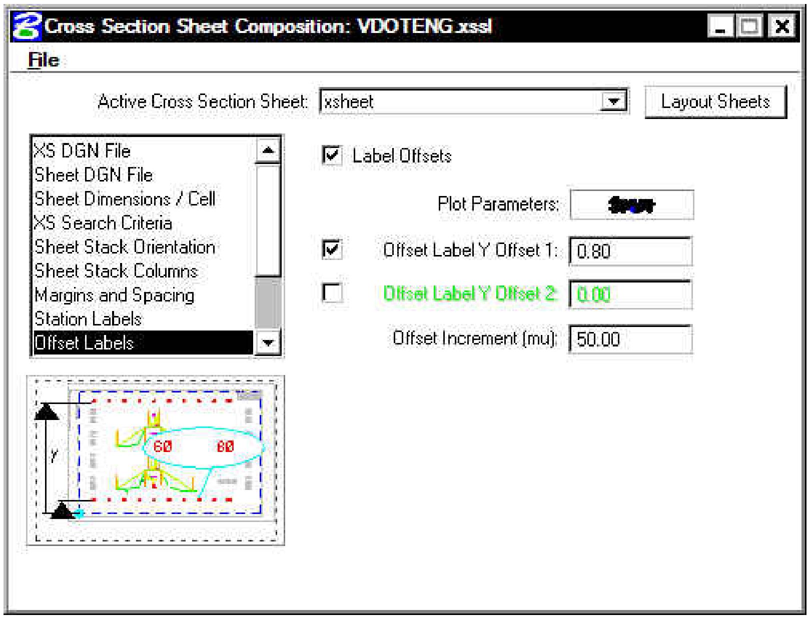
☑ Station Label X Offset 1: 16.00

☐ Station Label X Offset 2: 0.00

Station Label Y Offset: 0.00

File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
215+20.00

Offset Labels – Allows you to define the offset label positions, increments and plot parameters.



Cross Section Sheet Composition: VDOTENG.xssl

Active Cross Section Sheet: xsheet

☑ Label Offsets

Plot Parameters:

☑ Offset Label Y Offset 1: 0.80

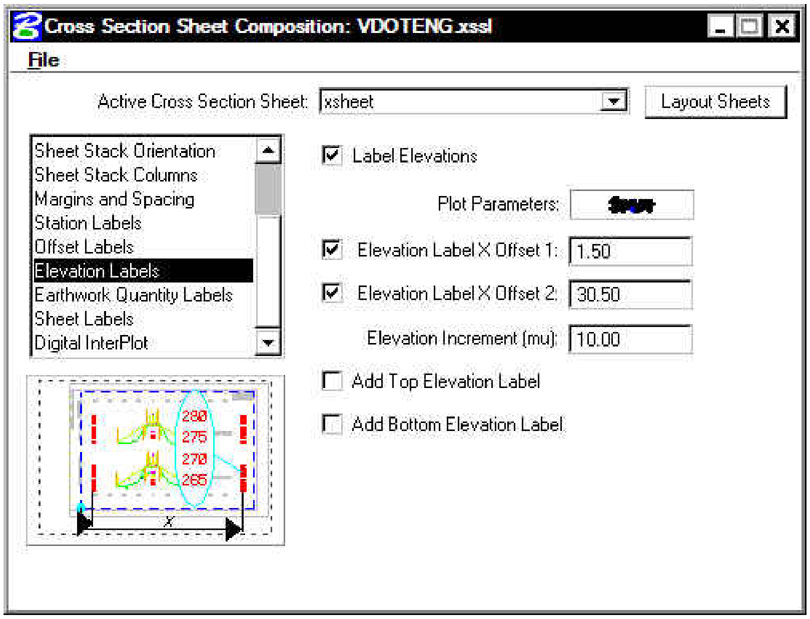
☐ Offset Label Y Offset 2: 0.00

Offset Increment (mu): 50.00

File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
60
80
Y

Elevation Labels – Allows you to control the elevation label locations, increment and plot parameters. Add Top Elevation Label - Activating this toggle adds another elevation label above the current labels placed within the elevation labels parameters. If two sets of elevations labels are placed (one on each side of the section), the top elevation is added to both.

Add Bottom Elevation Label - Activating this toggle adds another elevation label below the single label placed within the elevation labels parameters. If two sets of elevations labels are placed (one on each side of the section), the bottom elevation is added to both.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
Elevation Labels
Earthwork Quantity Labels
Sheet Labels
Digital InterPlot
280
275
270
265
X

Active Cross Section Sheet: xsheet

☑ Label Elevations

Plot Parameters:

☑ Elevation Label X Offset 1: 1.50

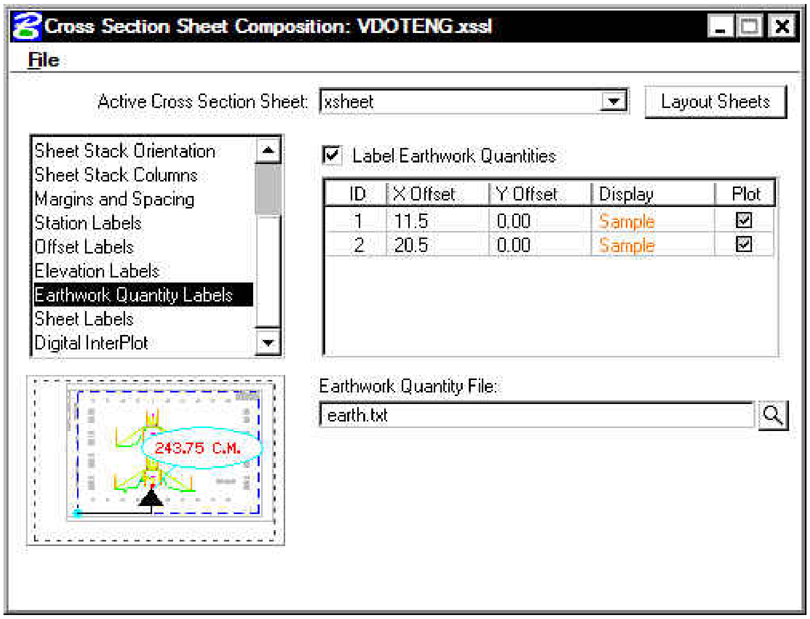
☑ Elevation Label X Offset 2: 30.50

Elevation Increment (mu): 10.00

☐ Add Top Elevation Label

☐ Add Bottom Elevation Label

Earthwork Quantity Labels – The user can define the ASCII file that contains the earthwork quantity information, as well as set the symbology and location of the earthwork quantity labels. This will use the information gathered during the earthwork run to place the earthwork quantity labels on the cross section sheets.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
Elevation Labels
Earthwork Quantity Labels
Sheet Labels
Digital InterPlot
243.75 C.M.

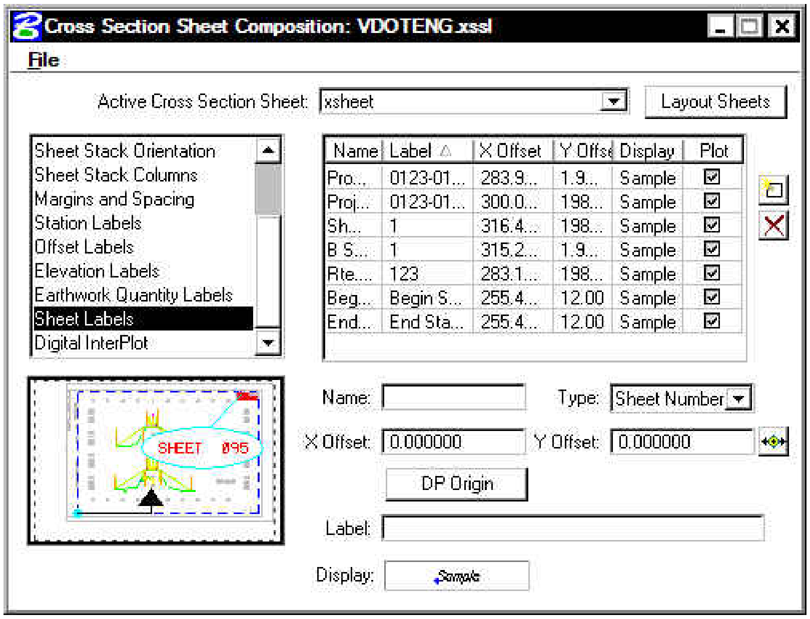
Active Cross Section Sheet: xsheet

☑ Label Earthwork Quantities

ID	X Offset	Y Offset	Display	Plot
1	11.5	0.00	Sample	☑
2	20.5	0.00	Sample	☑

Earthwork Quantity File:
earth.txt

Sheet Labels – Allows the placement of numerous labels. There are three sets of labels that can be placed where the labels change from sheet to sheet. These labels include Sheet Number, Begin Station, and End Station. Any number of custom labels can also be placed. These labels would be something that does not change from sheet to sheet such as Project Number, Designer, etc. A list of labels can be created and each label can have it's on symbology. Location of the labels is controlled by the DP Origin and DP Label Justification Point buttons. The DP Origin button locates the origin of the sheet cell and the DP Label Justification Point button sets the X and Y Offset from the sheet cell origin for the placement of the label.

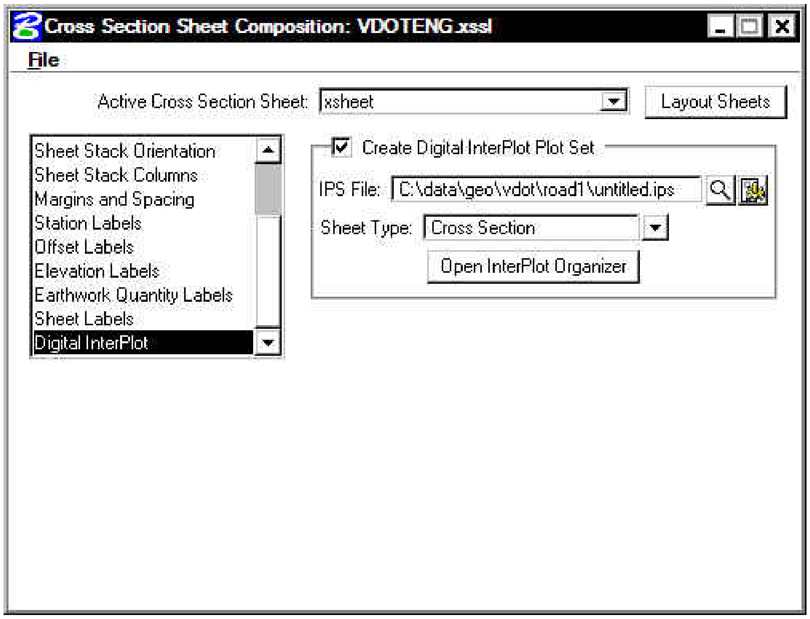

Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
Elevation Labels
Earthwork Quantity Labels
Sheet Labels
Digital InterPlot
SHEET 095
DP Origin

Active Cross Section Sheet: xsheet

Name	Label	X Offset	Y Offse	Display	Plot
Pro...	0123-01...	283.9...	1.9...	Sample	☑
Proj...	0123-01...	300.0...	198...	Sample	☑
Sh...	1	316.4...	198...	Sample	☑
B S...	1	315.2...	1.9...	Sample	☑
Rte....	123	283.1...	198...	Sample	☑
Beg...	Begin S...	255.4...	12.00	Sample	☑
End...	End Sta...	255.4...	12.00	Sample	☑

Name:
Type: Sheet Number
X Offset: 0.000000
Y Offset: 0.000000
Label:
Display: Sample

Digital InterPlot – Allows the creation of the Digital InterPlot Plot Set during the Layout Sheets process.

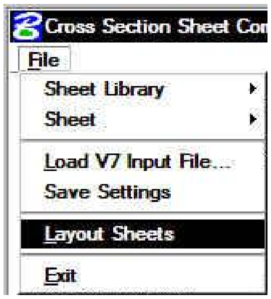

Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
Elevation Labels
Earthwork Quantity Labels
Sheet Labels
Digital InterPlot
Open InterPlot Organizer

Active Cross Section Sheet: xsheet

☑ Create Digital InterPlot Plot Set
IPS File: C:\data\geo\vdot\road1\untitled.ips
Sheet Type: Cross Section

14.4 Generating Sheets

From the **Files** menu, the **Layout Sheets** option will process all parameters that have been set in the **Cross Section Sheets** dialog box. There is also a **Layout Sheets** button on the main dialog.


Cross Section Sheet Co
File
Sheet Library
Sheet
Load V7 Input File...
Save Settings
Layout Sheets
Exit

LAB 14: Cross Section Sheets

14.1 Cross Section Sheet Layout

Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB14.EXE**.

Step 2. Open the MicroStation file **c:\data\geo\VDOT\PlansPrep\d17682xsheet.dgn**

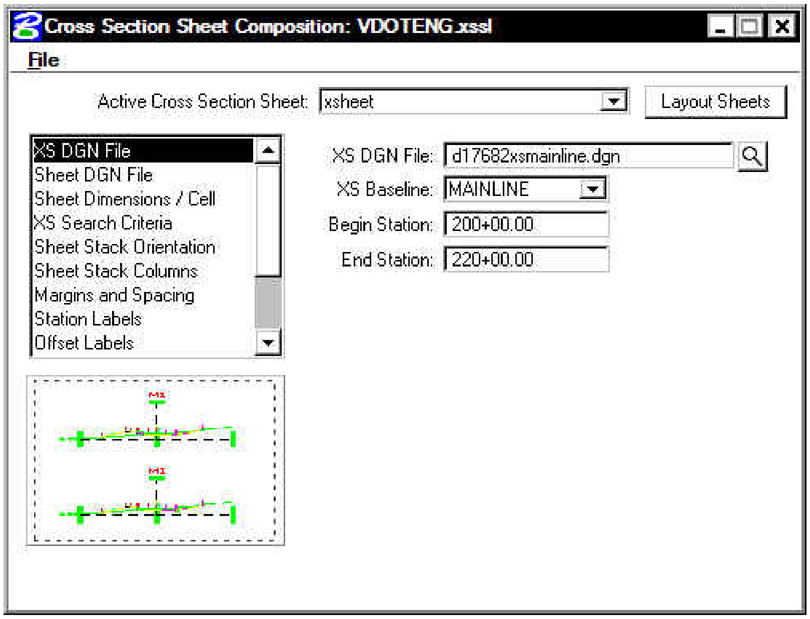
Access **Project Manager**. It should automatically access the Road workflow dialog box since we "remembered" the options in Exercise 2.

Step 3. Select the **Cross Section Sheets** button from the **Road Project: 17682.prj** workflow dialog box.

Step 4. Create a new run called **MAINLINE**.

Step 5. Select **File > Sheet Library > Attach**. Select **C:\data\geo\VDOT\PlansPrep\VDOTENG.xssl** then click **Open** if the Windows File Open dialog is used or **OK** if the MicroStation File Open dialog is used.

XS DGN File should already be populated with **d17682xsmainline.dgn** since this was set in the Working Alignment definition of Project Manager.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels

Active Cross Section Sheet: xsheet

XS DGN File: d17682xsmainline.dgn

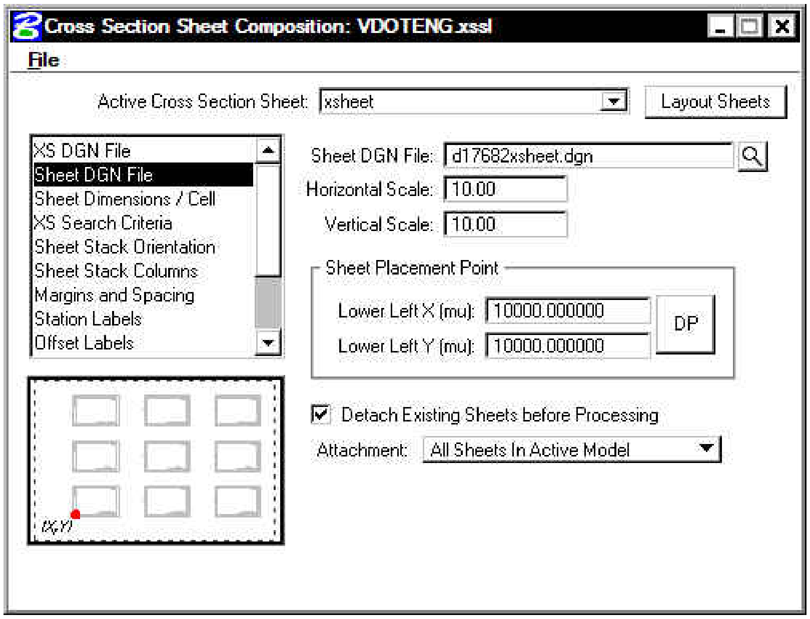
XS Baseline: MAINLINE

Begin Station: 200+00.00

End Station: 220+00.00

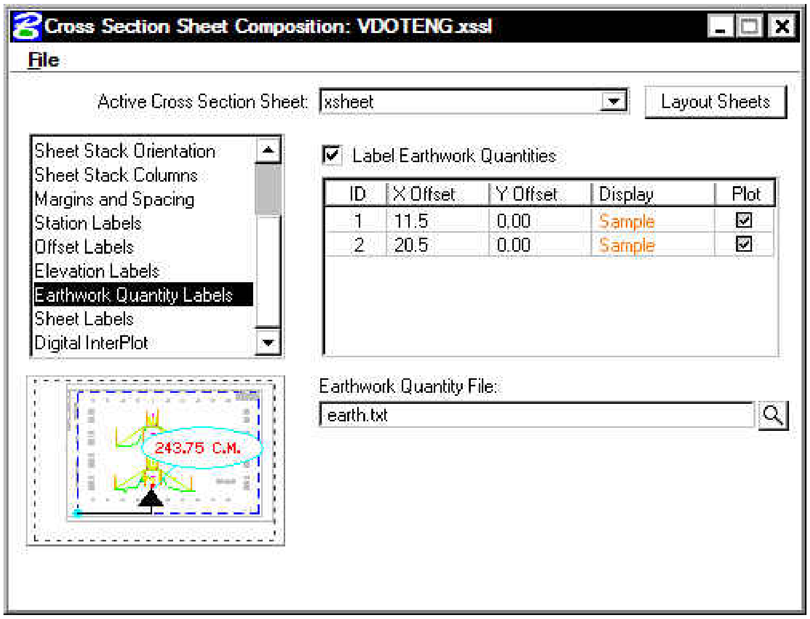
We will be using "**xsheet**" as the sheet name for our Cross Section Sheet layout.

Step 6. Click **Select Sheet DGN File** and select the sheet design file **d17682xsheet.dgn**. Toggle on "**Detach Existing Sheets before Processing**".


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
XS DGN File
Sheet DGN File
Sheet Dimensions / Cell
XS Search Criteria
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
Sheet Placement Point
DP
(X,Y)

Active Cross Section Sheet: xsheet
Sheet DGN File: d17682xsheet.dgn
Horizontal Scale: 10.00
Vertical Scale: 10.00
Lower Left X (mu): 10000.000000
Lower Left Y (mu): 10000.000000
☑ Detach Existing Sheets before Processing
Attachment: All Sheets In Active Model

Step 7. Select **Earthwork Quantity Labels**. Click **Select Earthwork Data File Icon** and select the **earth.txt** file created in the previous chapter.


Cross Section Sheet Composition: VDOTENG.xssl
File
Layout Sheets
Sheet Stack Orientation
Sheet Stack Columns
Margins and Spacing
Station Labels
Offset Labels
Elevation Labels
Earthwork Quantity Labels
Sheet Labels
Digital InterPlot
243.75 C.M.

Active Cross Section Sheet: xsheet
☑ Label Earthwork Quantities

ID	X Offset	Y Offset	Display	Plot
1	11.5	0.00	Sample	☑
2	20.5	0.00	Sample	☑

Earthwork Quantity File:
earth.txt

Step 8. Turn off level **50** then select **File > Save Settings** from the MicroStation pulldown menu.

Step 9. Process the cross sections onto the sheets using either the **File > Layout Sheets** pulldown or by clicking the **Layout Sheets** button on the **Cross Section Sheet Composition** dialog box.

Step 10. Dismiss the **Cross Section Sheet Composition** dialog box by pushing the "**x**" in the upper right hand corner.

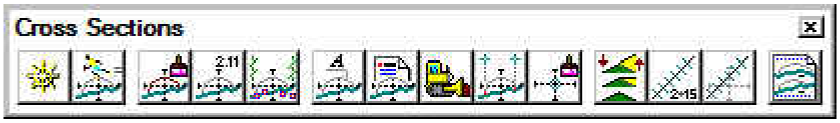
Step 11. When prompted to **Save Settings**, click **Yes**.

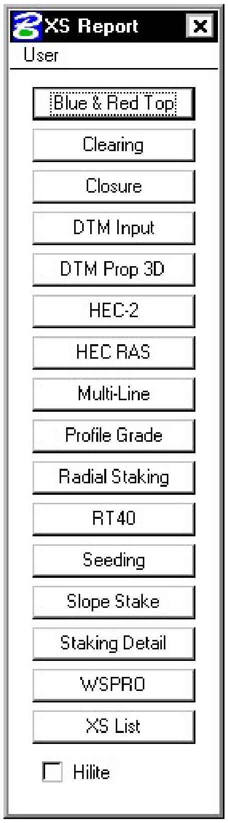
Step 12. When the Cross Section Sheet Layout process is completed, you will be in the sheet file. Review your work.

Step 13. Exit MicroStation.

XS Reports & Limits of Construction (Optional)

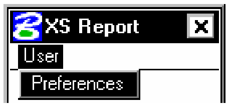
15.1 XS Reports

Objectives	Create various cross section reports: - for plan use (design elements and quantities) - as input for other programs and/or applications of GEOPAK - for construction layouts. Create and draw construction limits in the plan view file.
Project Manager	Reports and XS Quantities Limits of Construction
Tools	 Cross Sections
Menu Bar Application	GEOPAK Road > Cross Sections > Cross Section Reports GEOPAK Road > Cross Sections > Construction Limits

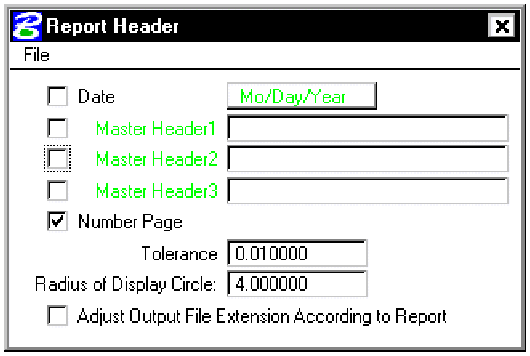

XS Report
User
Blue & Red Top
Clearing
Closure
DTM Input
DTM Prop 3D
HEC-2
HEC RAS
Multi-Line
Profile Grade
Radial Staking
RT40
Seeding
Slope Stake
Staking Detail
WSPRO
XS List
☐ Hilite

The GEOPAK Cross Section Report Utility can extract up to sixteen different reports from original and design cross-sections. For each report generated, the user must set the parameters of the existing and/or design cross sections. GEOPAK also provides an option to make custom headers for each of the reports via the **User** pull down menu.

15.1.1 Custom Header


XS Report
User
Preferences

From the XS Report dialog box, select **User > Preferences.** A Report Header dialog box will appear with all options ghosted out. To activate the individual fields simply toggle on the box next to the desired field. Once you have completed the dialog box, the information will be saved as an .hdr file. This allows for the creation of a separate header for each type of report. The tolerance field determines the maximum gap allowed between cross section elements.



☐ Date Mo/Day/Year
☐ Master Header1
☐ Master Header2
☐ Master Header3
☑ Number Page
Tolerance 0.010000
Radius of Display Circle: 4.000000
☐ Adjust Output File Extension According to Report

15.1.2 Blue and Red Top

Based on the dialog box settings, GEOPAK determines the offset and elevation of a slope and its breakpoints. Blue refers to the top of pavement and Red is the top of subgrade. The user must determine this by indicating text and level, color, weight and style for each surface.

15.1.3 Clearing

The **Clearing Report** is useful for obtaining clearing and grubbing quantities. For each station, GEOPAK will list the clearing distance on each side of the chain and the width of any exception. You can obtain the results in the appropriate units. Toggle boxes for Cut Slope Rounding, Additional Clearing in Cut and Fill, and Minimum Clearing Width are provided for increased control over the output.

GEOPAK can also generate quantity sub-totals based on the value specified in **Sub Every**.

To use the **Except Width** option, you must have an existing ASCII file that includes the Beginning and Ending Station and Exception Width.

Once everything is set, you can output the information to an ASCII file

15.1.4 Closure

The **Closure Report** provides information on the intersection point between the user defined proposed finish grade and existing ground. In addition to the ASCII report, the designer may instruct GEOPAK to close any gap either by drawing a vertical line between the endpoint of the proposed finish element and the existing ground or extending the slope of the last proposed element to intersect existing ground. The procedure will not extend existing ground. The **Closure Report** can be accessed within any MicroStation cross section file by selecting Closure from the main XS Reports dialog box.

15.1.5 DTM Input

This process generates XYZ coordinates from cross section elements and places this information into an ASCII file for use by the DTM portion of GEOPAK. To use this dialog box simply enter the .gpk job number, chain name and station range. GEOPAK will read the cross section elements based on level, weight, color and style.

15.1.6 DTM Proposed 3D

This report is similar to DTM Input except that you can set both original and proposed cross sections at the same time. This report also differs in that it makes break lines across the cross sections.

15.1.7 HEC – 2

This process reads cross section elements and formats the information in an ASCII text file suitable for use in the HEC-2 hydraulic program.

15.1.8 HEC RAS

This process reads cross section elements and formats the information in an ASCII text file suitable for use in the HEC RAS hydraulic program.

15.1.9 Multi-Line

This report is useful in creating cross-sections for staged construction. Begin by entering the job number, chain name and station limits. Primary cross section element parameters must be completed before secondary element parameters. This is important due to the order in which GEOPAK reads the information. Once all the parameters have been entered, the new cross sections may be drawn to the design file or you may choose the display only option. An ASCII text file will be generated.

15.1.10 Profile Grade

The **Profile Grade Repor**t is one of the most versatile reports available. It prints existing ground and design grade elevations and low point elevations for each cross section. Additionally, this report has the ability to search either for the low points or any text string that you specify and create horizontal and vertical alignments and store them directly into the .gpk. Horizontal alignments created from this report will have no curves.

15.1.11 Radial Staking

The **Radial Staking Report** is a specialized report created for the U.S. Federal Highway Administration (FHWA).

15.1.12 RT 40

The **RT 40 Report** produces RDS based RT40 data. To use this dialog box simply fill in the job chain name, stationing range and the parameters of the cross section elements you wish to use.

15.1.13 Seeding

Other than the usual entries, the user must enter the parameters of the elements to be seeded.

This dialog box includes slope and subtotal options as well as a way to limit the number of segments read (**By-Pass Segments**). The user may also establish additional seeding specifications (**Additional Distance**).

Once all of the settings are complete, the report will produce seed or sod quantities written to an ASCII output file for use in plan quantities.

15.1.14 Slope Stake

The **Slope Stake Report** is a special format report developed for the FHWA. This report generates offsets, elevations and superelevation information for each cross section. To generate this report fill in the usual cross section parameters plus Subgrade and Hub Staking information. When complete, push Apply and the report is written into an ASCII file.

15.1.15 Staking Detail

The **Staking Detail Report** determines the tie down point between the proposed finished grade and the existing ground. GEOPAK will list the right and left offset, elevation, and slope of the finish grade and superelevation rate for each cross section. To create this report, fill in the project information and desired cross section elements' parameters. Once complete, you have the choice between two formats, a FHWA ASCII report or a Montana DOT report (includes ditch elevations).

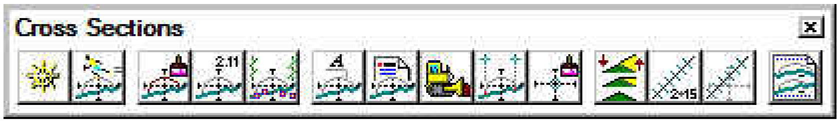
15.1.16 WSPRO

This report takes the cross section elements and turns them into an ASCII file for use as input in the WSPRO hydraulic analysis program.

15.1.17 XS List

This report creates a listing of elevations and offsets for each cross section element according to user defined parameters. You have the option of creating either an original cross section list or a design cross section list. These reports are very similar to RDS cross section lists.

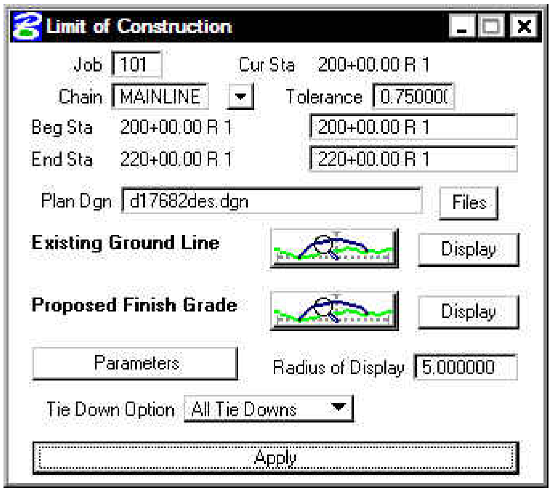
15.2 Limits of Construction

Project Manager	Limits of Construction. Note a run must be created.
Tools	
Menu Bar Application	GEOPAK Road > Cross Sections > Cross Section Reports GEOPAK Road > Cross Sections > Construction Limits

When the **Limits of Construction** dialog box is invoked, the Limits of Construction dialog box opens.

The user must specify the Job number, the chain name, and the file containing the plan view information. The **Existing Ground** and the **Proposed Finish Grade** sections should already be set correctly if Project Manager is utilized.

The **Parameters** button opens the dialog box below. The symbology for the cut, fill, and transition construction limits can be set in this dialog box.



Limit of Construction

Job 101 Cur Sta 200+00.00 R 1

Chain MAINLINE Tolerance 0.75000(

Beg Sta 200+00.00 R 1 200+00.00 R 1

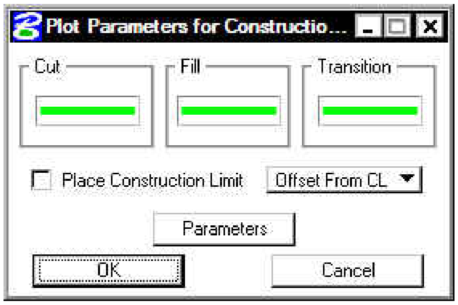
End Sta 220+00.00 R 1 220+00.00 R 1

Plan Dgn d17682des.dgn

Radius of Display 5.000000

Tie Down Option All Tie Downs

Files
Existing Ground Line
Display
Proposed Finish Grade
Display
Parameters
Apply

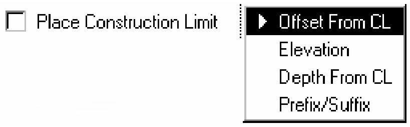


Plot Parameters for Constructio...

☐ Place Construction Limit Offset From CL

Cut
Fill
Transition
Parameters
OK
Cancel

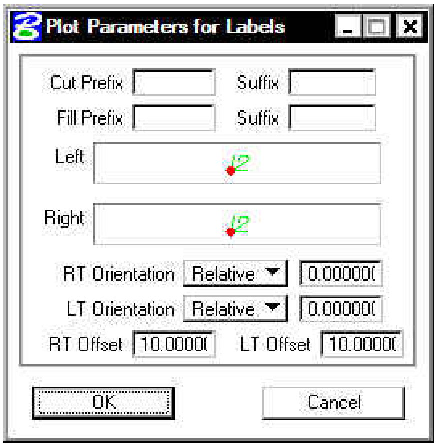
The **Place Construction Limit** toggle allows the user to place various text strings along the construction limits. Selecting the Parameters button, and making the desired changes in the dialog box shown on the next page will set the symbology for these text strings.



☐ Place Construction Limit
Offset From CL
Elevation
Depth From CL
Prefix/Suffix

The **Radius of Display** field is the size of the display circle when GEOPAK is scanning the cross-sections.

The last option in the main **Limits of Construction** dialog box is the **Tie Down Option**. There are two **Tie Down Options**. If the **All Tie Down** option is set, all tie downs within a section are plotted. (I.e. wide medians, outer roadways, ramps, etc. may have tie downs in between the limits of the main roadway, and the outer roadway or ramp.) If the **Outer Tie Down** option is selected, then only the outmost tie downs are plotted.


Plot Parameters for Labels
Cut Prefix
Suffix
Fill Prefix
Suffix
Left
Right
OK
Cancel

RT Orientation Relative 0.000000
LT Orientation Relative 0.000000
RT Offset 10.00000 LT Offset 10.00000

Once the **Apply** button is clicked, the limits of construction and the optional text are drawn into the plan view file at the specified symbology.

LAB 15: Cross Section Reports, Driveway Profiles, and Limits of Construction

15.1 Cross Section Reports

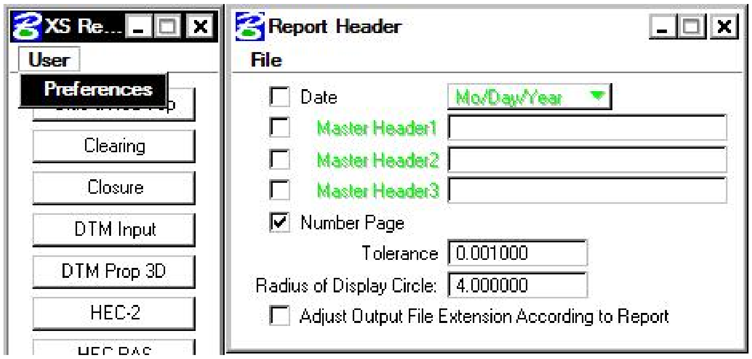
Step 1. Execute **C:\data\geo\VDOT\PlansPrep\LAB15.EXE**.

Step 2. Open **c:\data\geo\vdot\PlansPrep\d17682xsmainline.dgn**.

Step 3. Access Project Manager.

Step 4. Select **Reports** and **XS Quantities**.

Step 5. From the XS Reports dialog box, select the **User > Preferences** dialog box.


XS Re...
User
Preferences
Clearing
Closure
DTM Input
DTM Prop 3D
HEC-2
HEC RAS
Report Header
File
Mo/Day/Year
Master Header1
Master Header2
Master Header3

☐ Date

☐ Master Header1

☐ Master Header2

☐ Master Header3

☑ Number Page

Tolerance: 0.001000

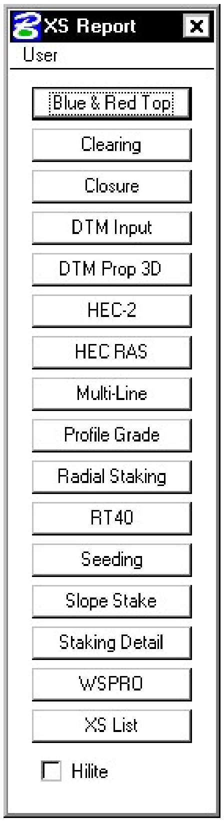
Radius of Display Circle: 4.000000

☐ Adjust Output File Extension According to Report

Set the tolerance to **.001**.

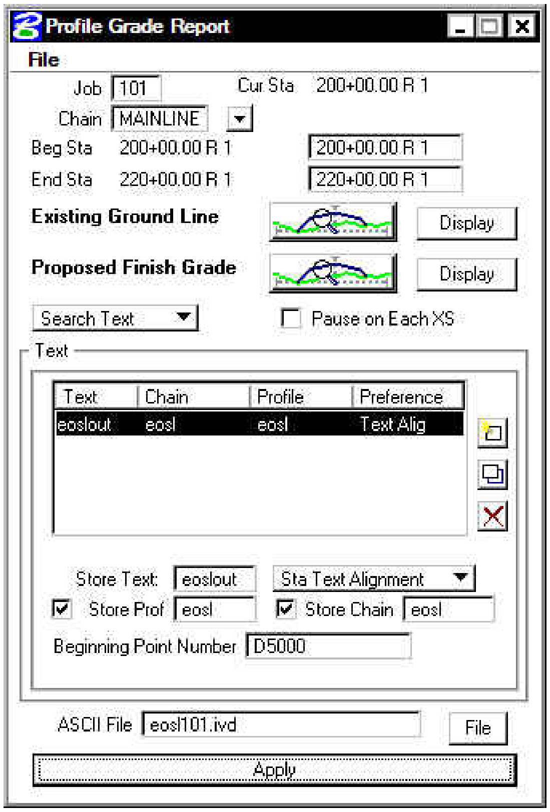
Dismiss the **Report Header** dialog box.

Step 6. From the **XS Reports** dialog box, select the **Profile Grade** report.


XS Report
User
Blue & Red Top
Clearing
Closure
DTM Input
DTM Prop 3D
HEC-2
HEC RAS
Multi-Line
Profile Grade
Radial Staking
RT40
Seeding
Slope Stake
Staking Detail
WSPRO
XS List
☐ Hilite

We are going to use this report to create a Chain and Profile along our left edge of shoulder. We'll use this information later to help in the creation of our driveway profiles.

Step 7. Fill out the **Profile Grade** dialog box as shown. The symbology settings for **Existing Ground Line** and **Proposed Finish Grade** should be set correctly from the Working Alignment Definition from Project Manager. To add the Text Search information to the collection box, push the **ADD** button. (Store Text: **EOSLOUT**)



Profile Grade Report

File

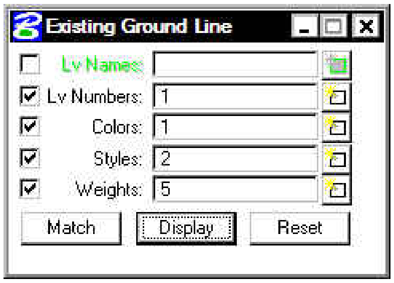
Job: 101
Cur Sta: 200+00.00 R 1
Chain: MAINLINE
Beg Sta: 200+00.00 R 1 — 200+00.00 R 1
End Sta: 220+00.00 R 1 — 220+00.00 R 1
Existing Ground Line — Display
Proposed Finish Grade — Display
Search Text
☐ Pause on Each XS

Text

Text	Chain	Profile	Preference
eoslout	eosl	eosl	Text Alig

Store Text: eoslout — Sta Text Alignment
☑ Store Prof: eosl
☑ Store Chain: eosl
Beginning Point Number: D5000
ASCII File: eosl101.ivd — File

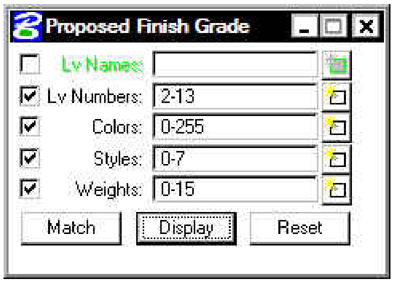
Apply



Existing Ground Line

☐ Lv Names:
☑ Lv Numbers: 1
☑ Colors: 1
☑ Styles: 2
☑ Weights: 5

Match — Display — Reset



Proposed Finish Grade

☐ Lv Names:
☑ Lv Numbers: 2-13
☑ Colors: 0-255
☑ Styles: 0-7
☑ Weights: 0-15

Match — Display — Reset

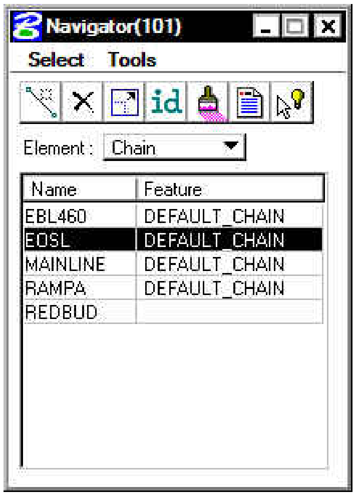
Step 8. Click **Apply.** After processing is complete, dismiss the **Profile Grade Report** dialog box.

Step 9. Access COGO.

Step 10. Access COGO Navigator using the icon

or use the **Tools > Navigator** pulldown.

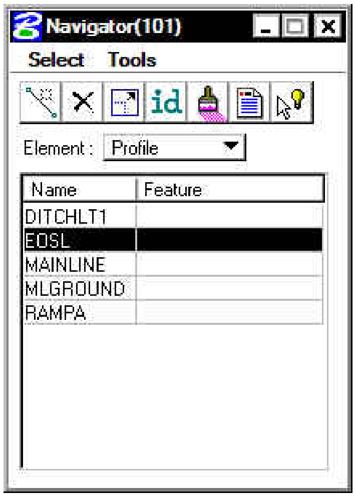
Step 11. Use the **Chain** option to see a list of the stored chains. Notice **EOSL** has been stored.


Navigator(101)
Select
Tools

Element : Chain

Name	Feature
EBL460	DEFAULT_CHAIN
EOSL	DEFAULT_CHAIN
MAINLINE	DEFAULT_CHAIN
RAMPA	DEFAULT_CHAIN
REDBUD	

Step 12. Use the **Profile** option to see a list of the stored profiles. Notice **EOSL** has been stored


Navigator(101)
Select
Tools

Element : Profile

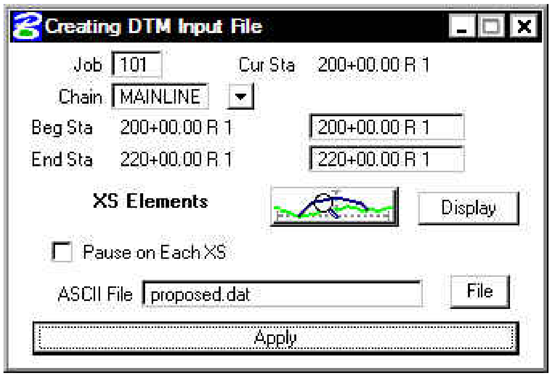
Name	Feature
DITCHLT1	
EOSL	
MAINLINE	
MLGROUND	
RAMPA	

Step 13. Exit **COGO**.

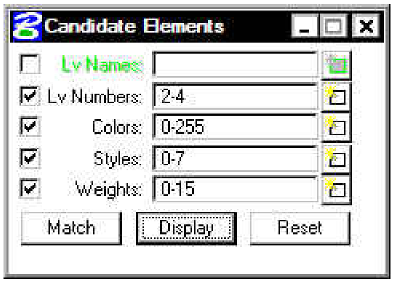
Step 14. From the **XS Reports** dialog box, select the **DTM Input** report.

We'll use this report to create a proposed model (dtm) from our cross sections. We'll also use this information later in the creation of our driveway profiles.

Step 15. Fill out the **DTM Input** dialog box as shown and click **Apply**.


Creating DTM Input File
XS Elements
Display
File
Apply

Job 101
Cur Sta 200+00.00 R 1
Chain MAINLINE
Beg Sta 200+00.00 R 1 200+00.00 R 1
End Sta 220+00.00 R 1 220+00.00 R 1
☐ Pause on Each XS
ASCII File proposed.dat


Candidate Elements
Match
Display
Reset

☐ Lv Names:
☑ Lv Numbers: 2-4
☑ Colors: 0-255
☑ Styles: 0-7
☑ Weights: 0-15

Note: The levels for XS Elements should only refer to 2-4. These are the levels that make up the top of Finish Grade.

Note that in Step 15 we only created a .dat file. This is an ascii file that is used to create the DTM. We'll create the dtm in the next section.

Step 16. After processing is complete, dismiss the **DTM Input** dialog box.

Step 17. Also dismiss the **XS Reports** dialog box.

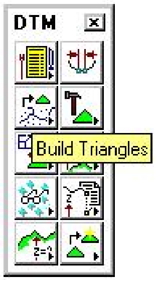
15.2 Driveway Profiles

Step 1. Before beginning the process to create the driveway profiles, we'll need to create the proposed DTM.

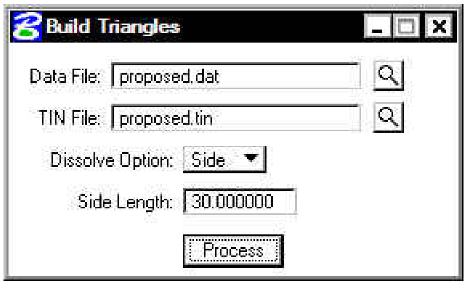
Select the **Existing Ground** button from the **Road Project: 17682.prj** workflow dialog box.

Step 2. Select the previously created run '**ground1**' and press OK.

Step 3. Select the **Build Triangles** icon from the DTM Tool Palette.



Step 4. Fill out the **Build Triangles** dialog box as shown and click **Process**.



Data File: proposed.dat

TIN File: proposed.tin

Dissolve Option: Side

Side Length: 30.000000

Step 5. Dismiss the **Build Triangles** dialog box. When prompted to save settings, push **Yes**. Dismiss the **DTM Tool Palette**.

Step 6. Open the Microstation design file **c:\data\geo\vdot\PlansPrep\d17682work.dgn**.

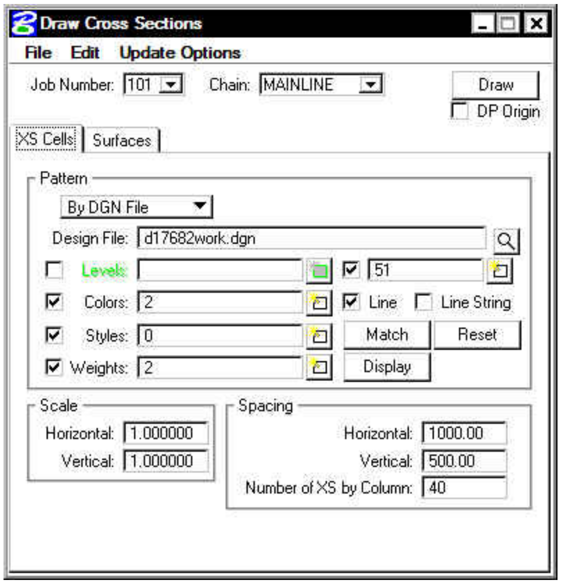
Note that pattern lines have been placed at the driveway locations. These pattern lines have the following symbology: **LV=51, CO=2, WT=2**.

Step 7. Open the Microstation design file **c:\data\geo\vdot\PlansPrep\d17682driveways.dgn**.

Step 8. Select the Existing Ground Cross Sections button from the Road Project: **17682.prj** workflow dialog box.

Create a new run '**DRIVEWAY**' and click **OK**.

Step 9. Fill out the dialog boxes as shown and click **Draw**.

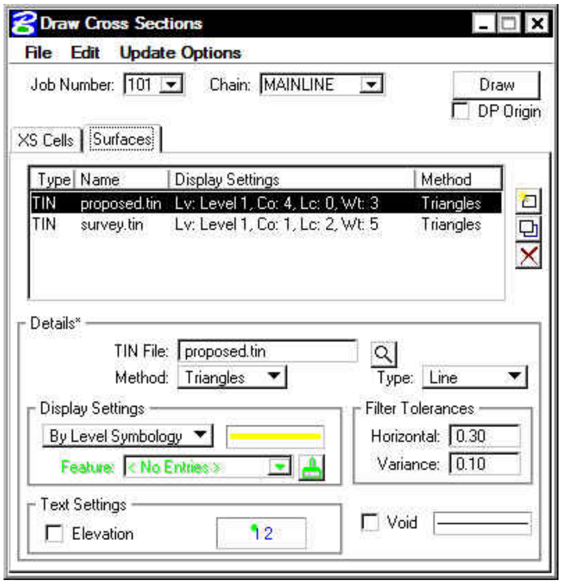

Draw Cross Sections
File Edit Update Options
Draw
XS Cells
Surfaces
Match
Reset
Display

Job Number: 101
Chain: MAINLINE
☐ DP Origin

Pattern
By DGN File
Design File: d17682work.dgn
☐ Levels:
☑ 51
☑ Colors: 2
☑ Line ☐ Line String
☑ Styles: 0
☑ Weights: 2

Scale
Horizontal: 1.000000
Vertical: 1.000000

Spacing
Horizontal: 1000.00
Vertical: 500.00
Number of XS by Column: 40


Draw Cross Sections
File Edit Update Options
Draw
XS Cells
Surfaces

Job Number: 101
Chain: MAINLINE
☐ DP Origin

Type	Name	Display Settings	Method
TIN	proposed.tin	Lv: Level 1, Co: 4, Lc: 0, Wt: 3	Triangles
TIN	survey.tin	Lv: Level 1, Co: 1, Lc: 2, Wt: 5	Triangles

Details*
TIN File: proposed.tin
Method: Triangles
Type: Line

Display Settings
By Level Symbology
Feature: < No Entries >

Filter Tolerances
Horizontal: 0.30
Variance: 0.10

Text Settings
☐ Elevation 12
☐ Void

Proposed Surface Symbology (**lv = 1, co=4, lc=0, wt=3**)

Existing Surface Symbology (**lv=1, co=1, lc=2, wt=5**)

Step 10. Dismiss the **Draw Cross Sections** dialog box and **Save Settings**.

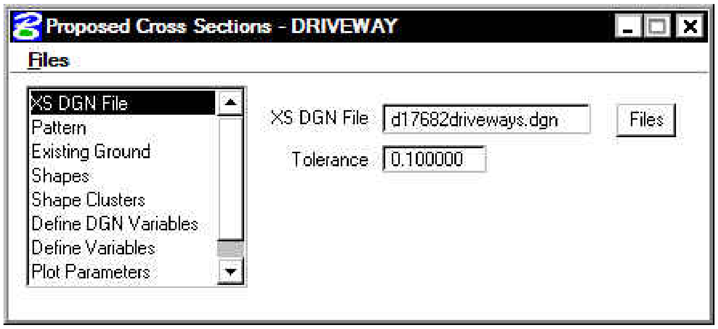
Review the ground lines drawn. Notice that the proposed ground line may not terminate precisely on the existing ground. This is because elevations are being interpolated between proposed cross sections.

You can tie this down manually or you can use the **XS Reports > Closure Report**.

Step 11. Select the **Proposed Cross Sections** button from the **Road Project: 17682.prj** workflow dialog box.

Create a new run '**DRIVEWAY**' and click **OK**.

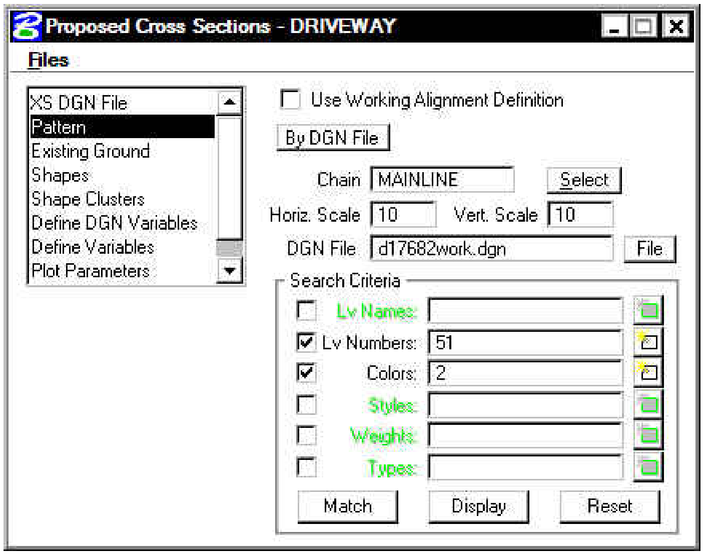
Step 12. Fill out the **XS DGN File** category as shown:


Proposed Cross Sections - DRIVEWAY
Files
XS DGN File
Pattern
Existing Ground
Shapes
Shape Clusters
Define DGN Variables
Define Variables
Plot Parameters
Files

XS DGN File: d17682driveways.dgn

Tolerance: 0.100000

Step 13. Fill out the **Pattern** category as shown:


Proposed Cross Sections - DRIVEWAY
Files
XS DGN File
Pattern
Existing Ground
Shapes
Shape Clusters
Define DGN Variables
Define Variables
Plot Parameters
By DGN File
Select
File
Search Criteria
Match
Display
Reset

☐ Use Working Alignment Definition

Chain: MAINLINE

Horiz. Scale: 10 Vert. Scale: 10

DGN File: d17682work.dgn

☐ Lv Names:

☑ Lv Numbers: 51

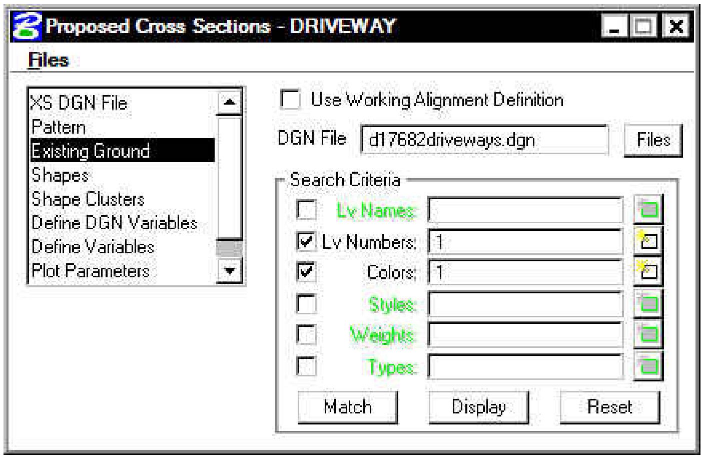
☑ Colors: 2

☐ Styles:

☐ Weights:

☐ Types:

Step 14. Fill out the **Existing Ground** category as shown:


Proposed Cross Sections - DRIVEWAY
Files
XS DGN File
Pattern
Existing Ground
Shapes
Shape Clusters
Define DGN Variables
Define Variables
Plot Parameters
Files
Search Criteria
Match
Display
Reset

☐ Use Working Alignment Definition

DGN File: d17682driveways.dgn

☐ Lv Names:

☑ Lv Numbers: 1

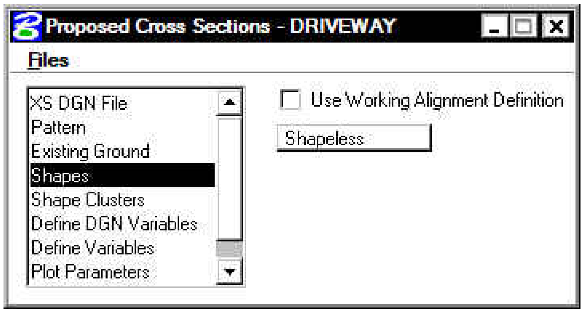
☑ Colors: 1

☐ Styles:

☐ Weights:

☐ Types:

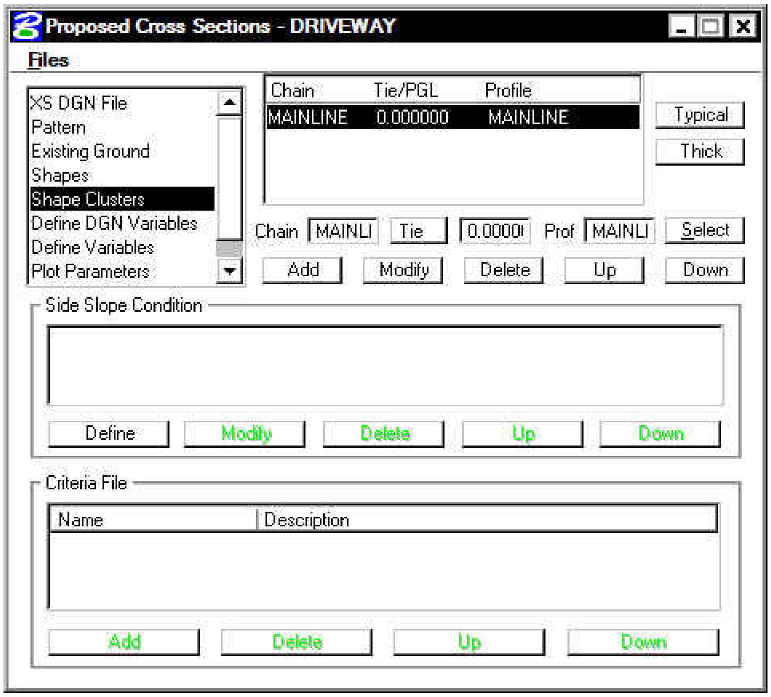
Step 15. Fill out the **Shapes** category as shown:


Proposed Cross Sections - DRIVEWAY
Files
XS DGN File
Pattern
Existing Ground
Shapes
Shape Clusters
Define DGN Variables
Define Variables
Plot Parameters

☐ Use Working Alignment Definition

Shapeless

Step 16. Under the **Shape Clusters** category, add the Mainline chain and profile to the list box as was done in previous exercises.

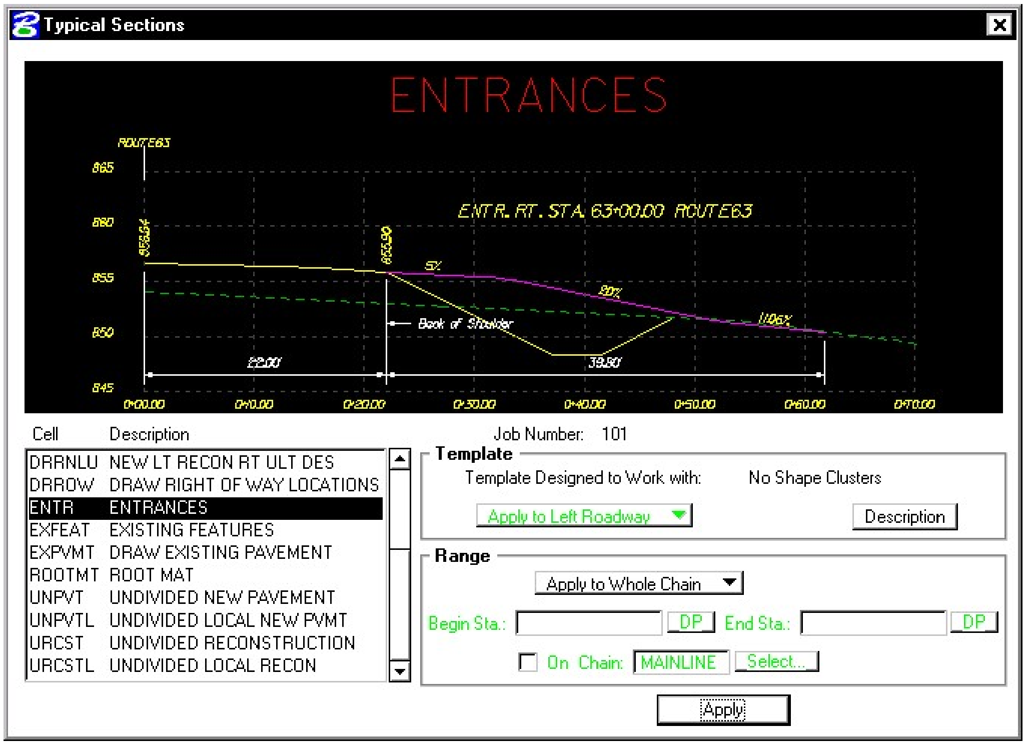

Proposed Cross Sections - DRIVEWAY
Files
XS DGN File
Pattern
Existing Ground
Shapes
Shape Clusters
Define DGN Variables
Define Variables
Plot Parameters
Typical
Thick
Tie
Select
Add
Modify
Delete
Up
Down
Side Slope Condition
Define
Modify
Delete
Up
Down
Criteria File
Name
Description
Add
Delete
Up
Down

Chain	Tie/PGL	Profile
MAINLINE	0.000000	MAINLINE

Chain MAINLI Tie 0.0000 Prof MAINLI

Step 17. Press the Typical button to access the Typical Section Generator.

Select the Typical **ENTR** and press **Apply**.


Typical Sections
ENTRANCES
ROUTE63
865
860
855
850
845
855.54
855.30
ENTR. RT. STA. 63+00.00 ROUTE63
5%
80%
1.06%
Back of Shoulder
22.00
39.80
0+00.00
0+10.00
0+20.00
0+30.00
0+40.00
0+50.00
0+60.00
0+70.00
Description
Apply to Whole Chain
DP
Select...
Apply

Cell	Description
DRRNLU	NEW LT RECON RT ULT DES
DRROW	DRAW RIGHT OF WAY LOCATIONS
ENTR	ENTRANCES
EXFEAT	EXISTING FEATURES
EXPVMT	DRAW EXISTING PAVEMENT
ROOTMT	ROOT MAT
UNPVT	UNDIVIDED NEW PAVEMENT
UNPVTL	UNDIVIDED LOCAL NEW PVMT
URCST	UNDIVIDED RECONSTRUCTION
URCSTL	UNDIVIDED LOCAL RECON

Job Number: 101

Template

Template Designed to Work with: No Shape Clusters

Apply to Left Roadway

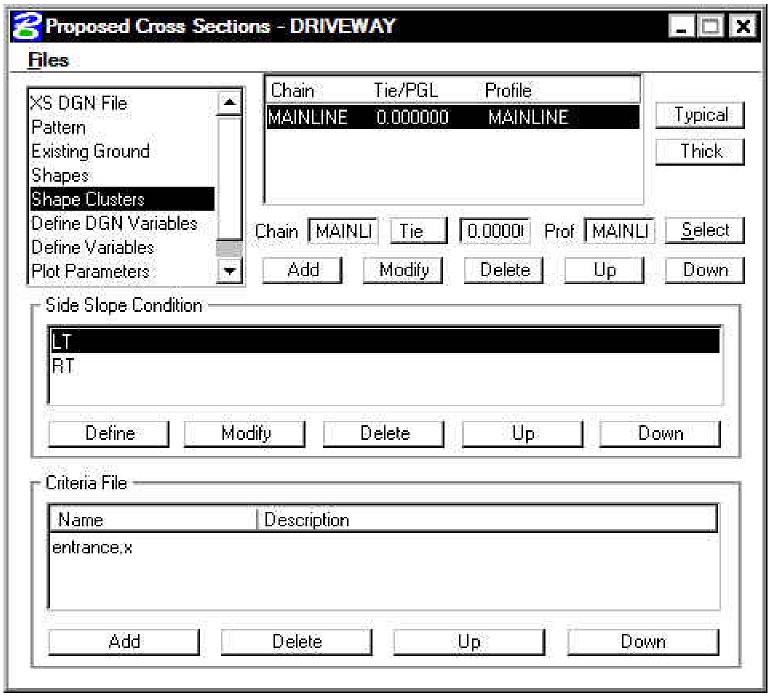
Range

Begin Sta.:
End Sta.:

☐ On Chain: MAINLINE

NOTE: Press the **Description** button and review the documentation.

Step 18. Your dialog box should fill out automatically and look like the following:


Proposed Cross Sections - DRIVEWAY
Files
XS DGN File
Pattern
Existing Ground
Shapes
Shape Clusters
Define DGN Variables
Define Variables
Plot Parameters
Typical
Thick
Select
Add
Modify
Delete
Up
Down
Side Slope Condition
Define
Modify
Delete
Up
Down
Criteria File
Add
Delete
Up
Down

Chain	Tie/PGL	Profile
MAINLINE	0.000000	MAINLINE

Chain MAINLI Tie 0.0000 Prof MAINLI

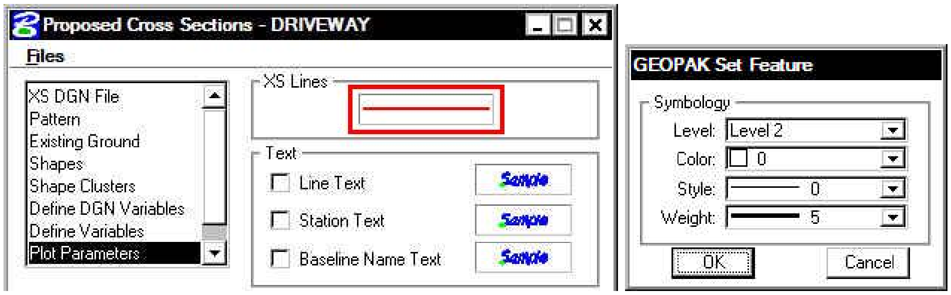
Side Slope Condition:
LT
RT

Name	Description
entrance.x	

Step 19. Select the **Define Variables** category. Modify the following variables as shown:

Name of Working File	**d17682work.dgn**
Name of Cross-Section File	**d17682driveways.dgn**
Lt Ent Take-Off Align Name	**EOSL**

Step 20. Select the **Plot Parameters** category. Double click the sample graphics box under **XS Lines**. Set the symbology as below then click **OK**.

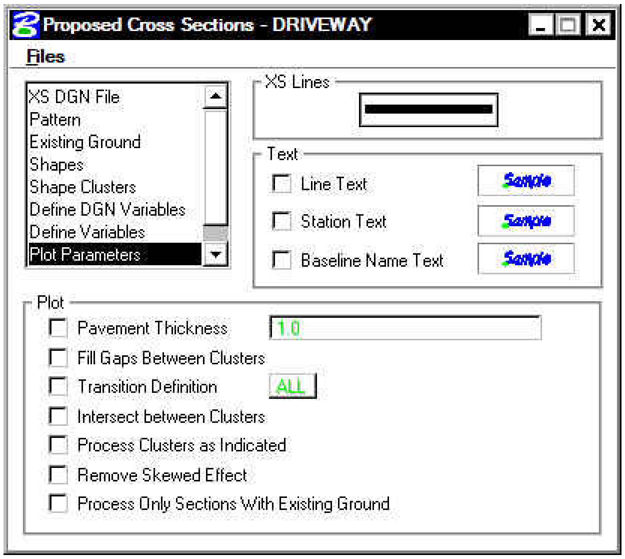

Proposed Cross Sections - DRIVEWAY
Files
XS DGN File
Pattern
Existing Ground
Shapes
Shape Clusters
Define DGN Variables
Define Variables
Plot Parameters
XS Lines
Text
Sample
Sample
Sample
GEOPAK Set Feature
Symbology
OK
Cancel

☐ Line Text
☐ Station Text
☐ Baseline Name Text

Level: Level 2
Color: 0
Style: 0
Weight: 5

Step 21. Under the **Text** section, ensure that **Line Text, Station Text,** and **Baseline Name Text** are toggled **off**.

Step 22. Toggle **off** all the options in the **Plot** section. The dialog box should appear as below.


Proposed Cross Sections - DRIVEWAY
Files
XS DGN File
Pattern
Existing Ground
Shapes
Shape Clusters
Define DGN Variables
Define Variables
Plot Parameters
XS Lines
Text
Sample
Sample
Sample
Plot

☐ Line Text
☐ Station Text
☐ Baseline Name Text

☐ Pavement Thickness 1.0
☐ Fill Gaps Between Clusters
☐ Transition Definition ALL
☐ Intersect between Clusters
☐ Process Clusters as Indicated
☐ Remove Skewed Effect
☐ Process Only Sections With Existing Ground

At this point we are ready to process the **DRIVEWAY** cross sections.

Step 23. Click **Files > Save Settings** then click **Files > Run**.

Step 24. When processing is complete, click **Exit** to return to the Process Cross Sections dialog box.

Step 25. Close the Proposed Cross Sections dialog box by using the “**X**” on the upper right of the dialog box or by using the **Files > Exit** pulldown.

When prompted to **Save Settings**, answer **Yes.**

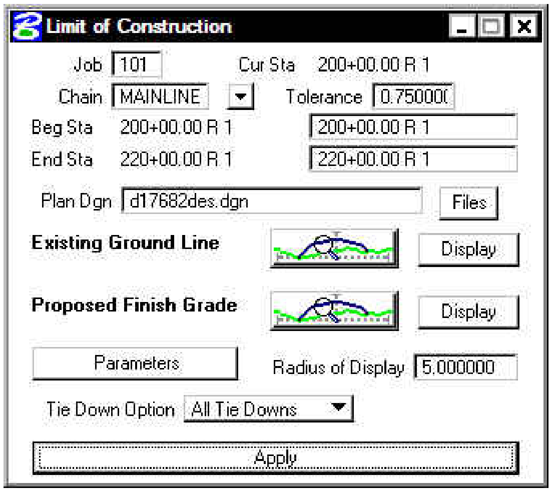
Step 26. Use Cross Section Navigator to review the cross sections.

15.3 Plan View Limits of Construction

Step 1. Open the Microstation design file **c:\data\geo\vdot\PlansPrep\d17682xsmainline.dgn**.

Step 2. From the **Road** workflow dialog box, select **Limits of Construction**. Create a run called **MAINLINE**.

Step 3. Populate the **Limits of Construction** dialog box as shown:



Limit of Construction

Job 101 Cur Sta 200+00.00 R 1

Chain MAINLINE Tolerance 0.75000(

Beg Sta 200+00.00 R 1 200+00.00 R 1

End Sta 220+00.00 R 1 220+00.00 R 1

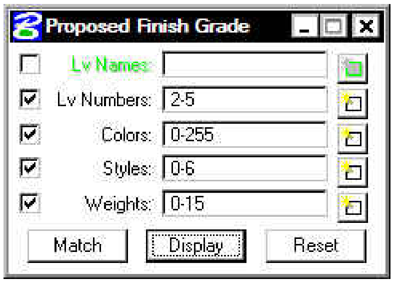
Plan Dgn d17682des.dgn

Existing Ground Line

Proposed Finish Grade

Radius of Display 5.000000

Tie Down Option All Tie Downs



Proposed Finish Grade

☐ Lv Names:

☑ Lv Numbers: 2-5

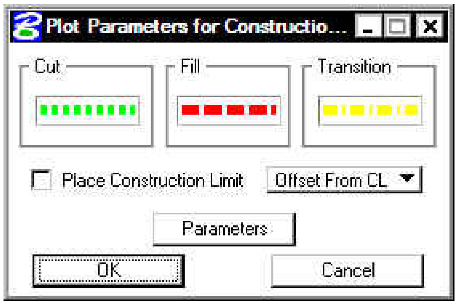
☑ Colors: 0-255

☑ Styles: 0-6

☑ Weights: 0-15

NOTE: The **Existing Ground Line** symbology should be OK since it was set in the Working Alignment Definition in Project Manager but the **Proposed Finish Grade** symbology will need to be set as shown above.

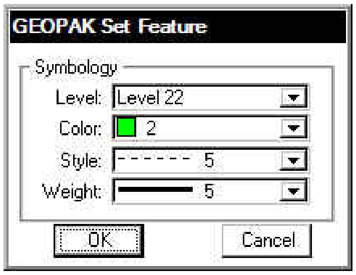
Step 4. Click the Parameters button to open the Plot Parameters dialog box. To access each of the Set Feature dialog boxes, double click on the sample graphics box in each section. Populate as shown:



Plot Parameters for Constructio...

☐ Place Construction Limit Offset From CL

Cut **Fill** **Transition**



GEOPAK Set Feature

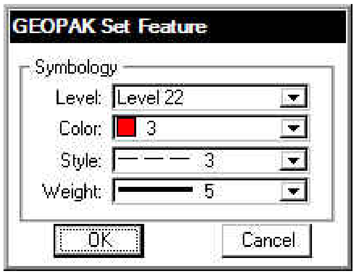
Symbology

Level: Level 22

Color: 🟩 2

Style: 5

Weight: 5



GEOPAK Set Feature

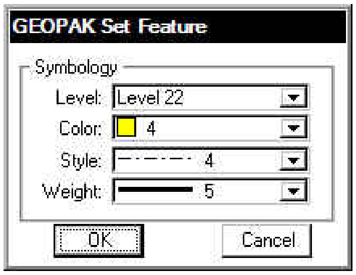
Symbology

Level: Level 22

Color: 🟥 3

Style: 3

Weight: 5



GEOPAK Set Feature

Symbology

Level: Level 22

Color: 🟨 4

Style: 4

Weight: 5

Step 5. Click **OK** to close the **Plot Parameters** dialog box.

Step 6. Click **Apply** to process the **Limits of Construction**.

Step 7. Exit the Limits of Construction dialog box and **Save Settings**. Review the limits of construction in **c:\data\geo\vdot\PlansPrep\d17682des.dgn**.

Since GEOPAK does not create the Limits of Construction exactly like VDOT would like to see them, we will use a special application to update them to the correct symbology.

Step 8. From the **Road** workflow dialog box, select **Plan View Design.**

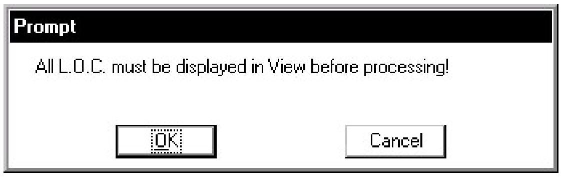
Step 9. From the Plan View Design tool palette, select **D&C Manager**.

Step 10. Navigate to the category **Road Design > Special Applications**.

Step 11. **Important!** Make sure that all of your Limits of Construction are shown in **View 1**.

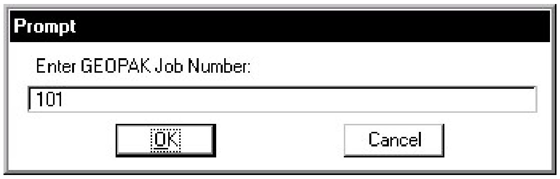
Step 12. Within this category, double-click on the item **Update LOC**.

Step 13. At the following prompt, click **OK**.



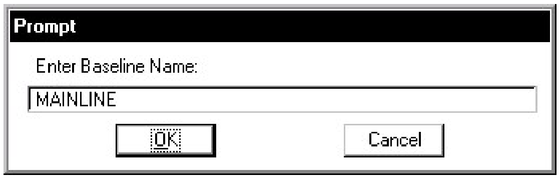
All L.O.C. must be displayed in View before processing!

Step 14. Enter the Job Number as shown and click **OK**.



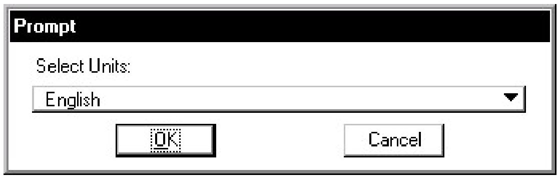
Enter GEOPAK Job Number: 101

Step 15. Enter the baseline name as shown and click **OK**.



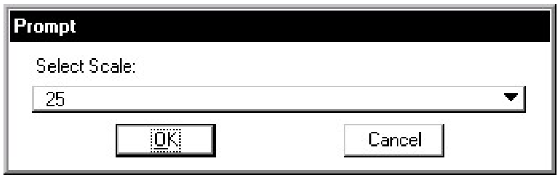
Enter Baseline Name: MAINLINE

Step 16. Set the units to **English** as shown and press **OK**.



Select Units: English

Step 17. Set the scale as shown and click **OK**.



Select Scale: 25

Step 18. Dismiss D&C Manager and review the changes made to the Limits of Construction.

Step 19. **Exit** MicroStation.